



GDP nowcasting for the euro area and member countries

2025 edition

STATISTICAL
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Manuscript completed in August 2025

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Luxembourg: Publications Office of the European Union, 2025

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Theme: Economy and finance

Collection: Statistical working papers

PDF KS-01-25-042-EN-N doi: 10.2785/95977173 ISSN 2315-0807 ISBN 978-92-68-31070-0

Abstract

This paper is concerned with the evaluation of the GDP nowcasting for the EA, BE, DE, ES, FR, IT and NL economies. It compares the performance of individual models as well as model averages across different estimation points,

i.e. $T - 30$, T and $T + 15$; for the individual models our evaluation sample consists of the most recent 12 quarters (2021Q4 to 2024Q3) whereas for the model averages, due to data availability, we use the last 3 quarters (2024Q1 to 2024Q3). In all cases, the estimates used in the evaluation were obtained in real-time. Our empirical results suggest that nowcasting models based on penalised regressions and model averages using a double-sorted filter work well across the underlying economies.

Production and layout

This paper was carried out by GOPA as part of a contract funded by Eurostat under the project 'Econometric Analyses Related to Principal European Economic Indicators (PEEIs),' specific contract No. 000067 associated with framework contract No. 2021.0364.

Data extraction

The data presented within this publication were extracted from the Eurostat database.

Keywords: Principal European Economic Indicators; Dynamic Factor Models; Unrestricted Mixed Data Sampling; Lasso; Nowcasting; Forecasting.

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1

Introduction

Economic nowcasting refers to the use of real-time data to estimate the current state of the economy, often with a focus on predicting key macroeconomic indicators such as GDP, inflation, and employment. This practise is essential for policymakers, analysts, and businesses who need timely insights, as traditional data collection methods typically lag behind real time economic conditions. Nowcasting models typically employ a combination of high-frequency data (e.g., financial markets, survey data, and Google Trends) and statistical techniques such as time series analysis, machine learning, and dynamic factor models (see, among others, Giannone et al., 2008; Croushore, 2011). These models aim to provide near-instantaneous forecasts that can capture economic changes as they unfold, ultimately offering a clearer picture of economic activity (Baumeister & Benati, 2013).

The COVID-19 pandemic has had profound and rapid effects on global economies. Nowcasting models, which typically rely on a combination of (high-frequency) data such as daily financial market indicators, consumer sentiment surveys, or mobility data (see, among others, Chudik et al., 2020; Kaufmann & Tishler, 2020), were crucial during the COVID-19 pandemic for monitoring economic activity as traditional data sources, such as quarterly GDP reports, lagged significantly behind. The pandemic-induced economic slowdown presented an opportunity to test the effective- ness of nowcasting models, particularly in forecasting GDP growth, unemployment rates, and inflation under rapidly changing conditions (see, e.g., Carriero et al., 2020) Giannone et al. (2020) explore the role of real-time data during crises, discussing how nowcasting models were enhanced by these new data sources to track economic activity more effectively. The use of machine learning techniques has also been prominent, with models trained to update in real-time as new data streams become available, thereby improving the accuracy of forecasts under high uncertainty (see, e.g., Pereira et al., 2021).

This paper is part of the above literature as our aim is to evaluate the nowcasting ability of various models for the Euro Area (EA) and six major EU economies from 2021 to 2024. The six economies under consideration include: BE, DE, ES, FR, IT and NL. It is important to notice that the estimates employed here are those obtained in real-time in 30 days prior to the target data (T-30), on the target date (T) and 15 days past the target date (T+15). The models were based on the authors constant effort to further improve existing models and include an approach for outliers

correction as well as various model averages (as discussed in the next sections). For that reason, the individual models are evaluated over 12 quarters whereas the model averages are evaluated only over the past 3 quarters (due to the fact that these averages were considered much later than the individual models).

The rest of the paper is organised as follows. Section 2 presents the various methodologies and models and includes the discussion on some data limitations. Section 3 presents the evaluation criteria. Section 4 is concerned with the empirical results and Section 5 provides some brief conclusions.

2

Methodology and models

We develop a large suite of nowcasting models to be evaluated in real-time combining a set of estimating methodologies and different ways to deal with the issue of mixed- frequency. To set the scene, let y_t , $t = 1, \dots, T$, be the target variable and $x_t = (x_{1t}, \dots, x_{Nt})'$ be a set of potential predictors, with N being very large. We do not assume a particular data generating process for y_t but simply posit the existence of a representation of the form:

$$y_t = a + g(x_{1t}, \dots, x_{Nt}) + u_t, \quad (1)$$

which implies that $E(u_t | x_{1t}, \dots, x_{Nt}) = 0$. While the potential nonlinearity in Equation (1) might, in principle, be worth exploring, it is extremely difficult to model nonlinearities in the context of large datasets. As a result, we consider an approximating linear representation of the form:

$$y_t = a + \sum_{i=1}^N \beta_i x_{it} + u_t, \quad (2)$$

with $u_t \sim \text{iidN}(0, \sigma_u^2)$.

Our main aim is to provide estimates for current values of y_t , where either no, or only a preliminary, value for y_t is available from official statistics. To do so, we can rely on many approaches, which can be categorised in two main strands. The first strand consists of reducing the dimension of x_t by producing a much smaller set of generated regressors, which can then be used to produce nowcasts and forecasts in standard ways. There are many ways to carry out dimensionality reduction, and here we focus on the three most popular ones; discussed in Section 2.1. The second strand aims to provide estimates for $\beta = (\beta_1, \dots, \beta_N)'$. While ordinary least squares (OLS) is the benchmark method for doing so, it is clear that if N is large this is not optimal or even feasible (when $N > T$). To avoid the problem of dimensionality, we consider the methodology of sparse regression, with origins in the machine learning literature, which is discussed in Section 2.2. A main aim there is to stabilise the variability of the estimated β_i . It is also possible that all or some of the available many indicators are observed at a different

frequency from that of the target variable. The resulting mixed-frequency setting and two suggested solutions are discussed in Section 2.3.

2.1 Dimensionality Reduction

A set of methods for modelling with large datasets involves the adoption of dimension reduction via techniques which do not require or impose any iid assumptions. In what follows we discuss the static Principal Components Analysis (PCA), Dynamic Factor Analysis (DFA) and the Partial Least Squares (PLS).

2.1.1 Principal Components Analysis

The most widely used class of data-rich forecasting methods are factor methods. Factor methods have been at the forefront of developments in forecasting with large data sets and in fact started this literature with the influential work of Stock and Watson (2002a). The defining characteristic of most factor methods is that relatively few summaries of the large data sets are used in forecasting equations, which thereby become standard forecasting equations as they only involve a few explanatory variables.

The main assumption is that the co-movements across the indicator variables x_t , where $x_t = (x_{1t} \cdots x_{Nt})'$ is a vector of dimension $N \times 1$, can be captured by a $r \times 1$ vector of unobserved factors $F_t = (F_{1t} \cdots F_{rt})'$, i.e.,

$$\tilde{x}_t = \Lambda' F_t + e_t \quad (3)$$

where $\tilde{x}_t$ may be equal to x_t or may involve other variables, such as lags, leads or products of the elements of x_t and Λ is an $r \times N$ matrix of parameters describing how the individual indicator variables relate to each of the r factors, which we denote with the term 'loadings'. In Equation 3) e_t is a zero-mean $I(0)$ vector of errors that represent, for each indicator variable, the fraction of dynamics unexplained by F_t , the 'idiosyncratic components'. The number of factors is assumed to be finite. So, implicitly, in Equation (2) $\alpha' = \tilde{\alpha}' \Lambda \tilde{x}_t$, where $F_t = \Lambda \tilde{x}_t$, which means that a small, r , number of linear combinations of $\tilde{x}_t$ represent the factors and act as the predictors for y_t , the target variable. The main difference between different factor methods relates to how Λ and the factors are estimated.

The use of PCA for the estimation of factor models is, by far, the most popular factor extraction method. It has been popularised by Stock and Watson (2002a) and Stock and Watson (2002b), in the context of large data sets, although the idea had been well established in the traditional multivariate statistical literature. The method of principal components is simple. Estimates of Λ and the factors F_t are obtained by solving:

$$V(r) = \min_{\Lambda, F} \frac{1}{NT} \sum_{i=1}^N \sum_{t=1}^T (\tilde{x}_{it} - \lambda_i' F_t)^2, \quad (4)$$

where λ_i is an $r \times 1$ vector of loadings that represent the N columns of $\Lambda = (\lambda_1 \cdots \lambda_N)$. One, non-unique, solution of Equation (4) can be found by taking the eigenvectors corresponding to the r

largest eigenvalues of the second moment matrix $X'X$, which then are assumed to represent the rows in Λ , and the resulting estimate of Λ provides the forecaster with an estimate of the r factors $\hat{F}_t = \hat{\Lambda}\tilde{x}_t$. To identify the factors up to a rotation, the data are usually normalized to have zero mean and unit variance prior to the application of principal components; see Stock and Watson (2002a) and Bai (2003). We note that factor estimates obtained via PC estimation are $\min(\sqrt{N}, T)$ consistent. Further, if $\sqrt{T}/N = o(1)$, using estimated factors rather than true factors in predictive regressions produces negligible estimation errors.

2.1.2 Dynamic Factor Analysis

PC estimation of the factor structure is essentially a static exercise as no lags or leads of x_t are considered. One alternative is dynamic principal components, which, as a method of factor extraction, has been suggested in a series of papers by Forni, Hallin, Lippi and Reichlin (see, e.g., Forni, et al., 2000, among others) and is designed to address this issue. Dynamic principal components are extracted in a similar fashion to static principal components but, instead of the second moment matrix, the spectral density matrix of the data at various frequencies is used. The dynamic PCs are then used to construct estimates of the common component of the data set, which is a function of the unobserved factors. The basic version of this method uses leads of the data, making it not suited in a forecasting context, but later work by the developers of the method has addressed this issue (see, e.g., Forni, et al., 2005).

In the nowcasting context, the DFA has been introduced and popularised by Giannone et al. (2008). In this setup, we have that:

$$\begin{aligned} \tilde{x}_t &= \Lambda' F_t + e_t \\ F_t &= \sum_{i=1}^p A_i F_{t-i} + B v_t, v_t \sim iidN(0, I_q) \end{aligned} \quad (5)$$

where B is $r \times q$ so that a smaller number of dynamic shocks, q , can be driving the r common factors. In the above equation the variables are loaded into the unobserved factors as in the static PCA case, and the factors evolve as a VAR(p) process driven by q shocks.

2.1.3 Partial Least Squares

Partial least squares (PLS) is a relatively new method for estimating regression equations, introduced in order to facilitate the estimation of multiple regressions when there is a large, but finite, amount of regressors⁽¹⁾. The basic idea is similar to Principal Component Analysis (PCA) in that factors or components, which are linear combinations of the original regression variables, are used, instead of the original variables, as regressors. PLS regression does not seem to have been explicitly considered for data sets with a very large number of series, i.e., when N is assumed in the limit to converge to infinity.

There are a variety of definitions for PLS and accompanying specific PLS algorithms that inevitably

⁽¹⁾ Herman Wold and co-workers introduced PLS regression between 1975 and 1982, see, e.g., Wold (1982). Since then it has received much attention in a variety of disciplines, especially in chemometrics, outside of economics.

have much in common. A conceptually powerful way of defining PLS is to note that the PLS factors are those linear combinations of x_t , denoted by Yx_t , that give maximum covariance between y_t and Yx_t while being orthogonal to each other. Of course, in analogy to PC factors, an identification assumption is needed, to construct PLS factors, in the usual form of a normalization.

A simple algorithm to construct k PLS factors is discussed among others, in detail, in Helland (1990). Assuming for simplicity that y_t has been demeaned and x_t have been normalized to have zero mean and unit variance, a simplified version of the algorithm is given below.

1. Set $u_t = y_t$ and $v_{i,t} = x_{i,t}$, $i = 1, \dots, N$. Set $j = 1$.
2. Determine the $N \times 1$ vector of indicator variable weights or loadings $w_j = (w_{1j} \dots w_{Nj})'$ by computing individual covariances: $w_{ij} = \text{Cov}(u_t, v_{i,t})$, $i = 1, \dots, N$. Construct the j -th PLS factor by taking the linear combination given by $w_j' v_t$ and denote this factor by $f_{j,t}$.
3. Regress u_t and u_t on $f_{j,t}$. Denote the residuals of these regressions by $\tilde{u}_t$ and $\tilde{v}_{i,t}$ respectively.
4. If $j = k$ stop, else set $u_t = \tilde{u}_t$, $v_{i,t} = \tilde{v}_{i,t}$, $i = 1, \dots, N$ and $j = j + 1$ and go to step 2.

This algorithm makes clear that PLS is computationally tractable for very large data sets. Once PLS factors are constructed y_t can be modeled or forecast by regressing y_t on $f_{j,t}$, $j = 1, \dots, k$. Helland (1990) provides a general description of the partial least squares (PLS) regression problem. Helland (1990) shows that the estimates of the coefficients α in the regression of y_t on x_t , as in Equation (2), obtained implicitly via PLS Algorithm and a regression of y_t on $f_{j,t}$, $j = 1, \dots, k$, are mathematically equivalent to

$$\hat{\beta}_{PLS} = V_k(V_k'X'XV_k)^{-1}V_k'X'y \quad (6)$$

With $V_k = (X'y \quad X'XX'y \quad \dots \quad (X'X)^{k-1}X'y)$, $X = (x_1 \dots x_T)'$ and $y = (y_1 \dots y_T)'$. Thus, (6) suggests that the PLS factors that result from the PLS Algorithm span the Krylov subspace generated by $X'X$ and $X'y$, resulting in valid approximations of the covariance between $y_{t,t}$ and x_t .

A major difference between PC and PLS is that, whereas in PC regressions the factors are constructed taking into account only the values of the x_t variables, in PLS, the relationship between y_t and x_t is considered as well in constructing the factors.

More recently, Kelly and Pruitt (2015) and Groen and Kapetanios (2016) have extended and provided theoretical results on PLS, showing that it can be also applied in the large N context, while Hepenstrick and Marcellino (2019) have introduced the mixed frequency version and provided empirical evidence in favour of its use for nowcasting with very large datasets.

2.2 Sparse Regression

Penalised regression is one of the most popular ways for sparse regression in the literature. Various penalties have been suggested in order to effectively estimate the β_i parameters assigning zeros to the variables which should not be used in the regression (meaning that these are not part of the true model) and consequently in the forecasting exercise. In what follows we denote $\beta_N = (\beta_1, \dots, \beta_N)'$ and $x_N = (x_1, \dots, x_N)'$.

2.2.1 Ridge Regression

Ridge Regression creates a linear regression model that is penalised with the L2- norm which is the sum of the squared coefficients. This has the effect of shrinking the coefficient values (and the complexity of the model) allowing some coefficients with minor contribution to the response to get close to zero (but not exactly equal to zero). The parameter estimators, $\hat{\beta}^{\text{Ridge}}$, are then computed by solving the following optimisation problem:

$$\min_{\beta_N} \left\{ \sum_{t=1}^T (y_t - a - \beta_N' x_{t,N})^2 + \lambda \sum_{i=1}^N \beta_i^2 \right\}, \quad (7)$$

for given values of a and λ . λ is the penalty parameter. OLS corresponds to the no penalty case, where $\hat{\beta}^{\text{Ridge}} \rightarrow \hat{\beta}^{\text{OLS}}$ as $\lambda \rightarrow 0$. Also, it can be easily seen that $\hat{\beta}^{\text{Ridge}} \rightarrow 0$ as $\lambda \rightarrow \infty$. By centering the columns of x , the intercept becomes $\hat{a} = \bar{y}$. Therefore, we typically center y, x_N and do not include the intercept term.

The variance and bias of the ridge regression estimator can be shown to be:

$$\begin{aligned} \text{Var}(\hat{\beta}^{\text{Ridge}}) &= \sigma^2 W x_N' x_N W \\ \text{Bias}(\hat{\beta}^{\text{Ridge}}) &= -\lambda W \beta \end{aligned}$$

Where $W = (x_N' x_N + \lambda I)^{-1}$. It can be shown that the total variance ($\sum_j \text{Var}(\hat{\beta}_j)$) is a monotone decreasing sequence with respect to λ , while the total squared bias ($\sum_j \text{Bias}^2(\hat{\beta}_j)$) is a monotone increasing sequence with respect to λ . The standard OLS assumptions are also required for Ridge regression.

Nowcasting using Ridge regression is straightforward and easy, in particular when implemented in a direct rather than iterated way (e.g., Marcellino et al., 2006). The algorithm can be described in three steps.

1. Replace the loss function with $\min_{\beta_{N,h}} \left\{ \sum_{t=1}^T (y_t - a - \beta_{N,h}' x_{t-h,N})^2 + \lambda \sum_{i=1}^N |\beta_{i,h}| \right\}$
where h is the forecast horizon of interest, and compute $\widehat{\beta}_h^{\text{Ridge}}$ for each of a set of values of the tuning parameter λ .
2. Use a cross-validation (CV) scheme to select the preferred tuning parameter $\hat{\lambda}$, by minimising the cross-validated squared error risk (or directly the MSE over a rolling window, see e.g. Kapetanios, Marcellino and Venditti (2019)).
3. Using the $\hat{\beta}_h^{\text{Ridge}}$ associated with $\hat{\lambda}$, produce the h – step ahead forecasts as $\hat{\beta}_h^{\text{Ridge}} x_{T,N} (+\hat{a})$.

The above procedure is then recursively repeated in order to obtain the R out-of- sample forecasts $\hat{y}_{T+h}, \dots, \hat{y}_{T+R+h}$. It must be noted here that the above nowcasting implementation algorithm can be applied in all variable selection methods. Therefore, all the sparse regression methods which follow can produce nowcast estimates in the same fashion. Since

Ridge regression does not set coefficients exactly to zero (unless $\lambda \rightarrow \infty$, in which case they are all zero), ridge regression cannot perform variable selection and, even though it might perform well in terms of prediction accuracy, it does not offer a clear interpretation of the resulting estimates.

2.2.2 LASSO Regression

Least Absolute Shrinkage and Selection Operator (LASSO) creates a regression model that is penalised with the L1-norm which is the sum of the absolute coefficients. Because of the nature of this constraint, it tends to produce some coefficients that are exactly 0 and hence gives more interpretable models. Simulation studies suggest that the LASSO enjoys some of the favourable properties of both subset selection and ridge regression. As originally noted by Tibshirani (1996), the lasso regression is better suited for predictor selection compared to the Ridge regression because the former method performs model/predictors selection keeping those variables which are more suitable for forecasting. The optimisation problem now becomes:

$$\min_{\beta_N} \left\{ \sum_{t=1}^T (y_t - a - \beta'_N x_{t,N})^2 + \lambda \sum_{i=1}^N |\beta_i| \right\}. \quad (8)$$

Although we cannot write the explicit formulas for the bias and variance of the LASSO estimator, the general trend is that the bias increases as λ increases and the variance decreases as λ increases.

Following Bühlmann and van de Geer (2011), we summarise the key properties and corresponding assumptions for the LASSO. Considering the true model in Equation (2), it is:

$$\frac{1}{T} \sum_{t=1}^T (x_{t,N}(\hat{\beta}^{LASSO} - \beta))^2 = O_P \left(\sum_{i=1}^N |\beta_i| \sqrt{\log(N)/T} \right), \quad (9)$$

where $O_P(\cdot)$ is with respect to $N \geq T \rightarrow \infty$. This implies that we achieve consistency of prediction if $\sum_{i=1}^N |\beta_i| \ll \sqrt{T/\log(N)}$.

Faster convergence rate and estimation error bounds with respect to the L1- or L2-norm can be achieved using the so-called oracle optimality condition:

$$\begin{aligned} \frac{1}{T} \sum_{t=1}^T (x_{t,N}(\hat{\beta}^{LASSO} - \beta))^2 &= O_P(s_0 \phi^{-2} \log(N)/T) \\ \sum_{i=1}^N |\hat{\beta}_i^{LASSO} - \beta_i|^q &= O_P(s_0^{1/q} \phi^{-2} \sqrt{\log(N)/T}), q = \{1, 2\} \end{aligned} \quad (10)$$

where s_0 equals the true number of non-zero regression coefficients and ϕ^2 is the compatibility constant or restricted eigenvalue which is a number depending on the compatibility between the design and the L1-norm of the regression coefficient. The above rate is optimal up to the $\log(N)$ factor and the restricted eigenvalue ϕ^2 .

Additionally to the oracle optimality and assuming the beta-min condition

$$\min_{i \in S_0^c} |\beta_i| \gg \phi^{-2} \sqrt{s_0 \log(N)/T},$$

we obtain the screening variable property

$$P[\hat{S} \supseteq S] \rightarrow 1 \quad (N \geq T \rightarrow \infty) \quad (11)$$

Where $\hat{S} = \{i; \hat{\beta}_i^{\text{LASSO}} \neq 0, i = 1, \dots, N\}$ and $S = \{i; \beta_i \neq 0, i = 1, \dots, N\}$. Consistent variable selection then means

$$P[\hat{S} = S] \rightarrow 1 \quad (N \geq T \rightarrow \infty). \quad (12)$$

The above facts are summarised in the table below.

Property	Design Condition	Size of non-zero coef.
Slow Convergence Rate (Eq. (9))	No requirement	No requirement
Fast Convergence Rate (Eq. (10))	Compatibility	No requirement
Variable Screening (Eq. (11))	Restricted eigenvalue	beta-min condition
Variable Selection (Eq. (12))	Neighborhood Stability	beta-min condition

2.2.3 Elastic Net

Elastic Net (EN) creates a regression model that is penalised with both the L1-norm and L2-norm. Introduced by Zou and Hastie (2005), the elastic net has the effect of effectively shrinking coefficients (as in ridge regression) and setting some coefficients to zero (as in LASSO). The optimisation problem now is:

$$\hat{\beta}^{\text{naiveEN}} = \min_{\beta_N} \left\{ \sum_{t=1}^T (y_t - a - \beta_N' x_{t,N})^2 + \lambda_1 \sum_{i=1}^N |\beta_i| + \lambda_2 \sum_{i=1}^N \beta_i^2 \right\}. \quad (13)$$

The above is called the naive elastic net. A correction which leads to the elastic net is then

$$\hat{\beta}^{\text{EN}} = (1 + \lambda_2) \hat{\beta}^{\text{naiveEN}}.$$

The correction factor $(1 + \lambda_2)$ is best motivated from the orthonormal design where $\frac{1}{T} x_N' x_N = I$.

The main advantage of the elastic net is its usefulness when the number of predictors is much bigger than the number of observations, which is usually the case in our big data context.

The reason for adding an additional squared L2-norm penalty is motivated by Zou and Hastie (2005) as follows. For strongly correlated covariates, the LASSO may select one but typically not both of them (and the non-selected variable can then be approximated as a linear function of the selected one). From the point of view of sparsity, this is what we would like to do. However, in terms of interpretation, we may want to have two even strongly correlated variables among the selected variables: this is motivated by the idea that we do not want to miss a 'true' variable due to selection of a 'non-true' which is highly correlated with the true one.

2.3 Mixed Frequency Methods

2.3.1 Bridge models

One of the early econometric approaches in the presence of mixed-frequency data relies on the use of bridge equations, see e.g. Baffigi et al. (2004) and Diron (2008). Bridge equations are linear regressions that link ('bridge') high frequency variables, such as industrial production or retail sales or Google Trends, to low frequency ones,

e.g. the quarterly real GDP growth, providing some estimates of current and short-term developments in advance of the release. The 'Bridge model' technique allows computing early estimates of the low-frequency variables by using high frequency indicators. They are not standard macroeconomic models, since the inclusion of specific indicators is not based on causal relations, but on the statistical fact that they contain timely updated information. In principle, bridge models require that the whole set of regressors should be known over the projection period, allowing for an estimate only of the current period. In practice, anyway, this is not the case, even though the forecasting horizon of the bridge models is quite short, one or two quarters ahead at most.

Taking forecasting GDP as an example, since the monthly indicators are usually only partially available over the projection period, the predictions of quarterly GDP growth are obtained in two steps. First, monthly indicators are forecasted over the remainder of the quarter, usually on the basis of univariate time series models (in some cases VAR have been implemented in order to obtain better forecasts of the monthly indicators), and then aggregated to obtain their quarterly correspondent values. Second, the aggregated values are used as regressors in the bridge equation which allows to obtain forecasts of GDP growth.

Therefore, the bridge model to be estimated is:

$$y_{t_q} = \alpha + \sum_{i=1}^j \beta_i(L)x_{it_q} + u_{t_q} \quad (14)$$

where $\beta_i(L)$ is a lag polynomial of length $\beta_i(L)$, and x_{it_q} are the monthly indicators aggregated at quarterly frequency.

The selection of the monthly indicators included in the bridge model is usually based on a general-to-specific methodology and relies on different in-sample or out-of-sample criteria, like information criteria or RMSE performance.

2.3.2 Unrestricted MIDAS

Foroni et al. (2015) study the performance of a variant of MIDAS which does not resort to functional distributed lag polynomials. In the paper, the authors discuss how unrestricted MIDAS (UMIDAS) regressions can be derived in a general linear dynamic framework, and under which conditions the parameters of the underlying high-frequency model can be identified.

The UMIDAS model is based on a linear lag polynomial such as

$$c(L^m)\omega(L)y_{t_m} = \delta_1(L)x_{1t_m-1} + \dots + \delta_N(L)x_{Nt_m-1} + \epsilon_{t_m}, \quad (15)$$

$$t = 1, 2, 3, \dots$$

Where $c(L^m) = (1 - c_1L^m - \dots - c_cL^{mc})$, $\delta_j(L) = (\delta_{j,0} + \delta_{j,1}L + \dots + \delta_{j,v}L^v)$, $j = 1, \dots, N$.

Note that if we assume that the lag orders c and v are large enough to make the error term ϵ_{t_m} uncorrelated, then, all the parameters in the U-MIDAS model in Equation (15) can be estimated by simple OLS (while the aggregation scheme $\omega(L)$ is supposed known). From a practical point of view, the lag order v could differ across variables, and v_i and c could be selected by an information criterion such as BIC. As the model is linear, all the specification methods for big data we have discussed in the previous sections can still be applied.

A simple approach to nowcasting is to use a form of direct estimation and construct the forecast as

$$\tilde{y}_{T_m^x+m|T_m^x} = \tilde{c}(L^k)y_{T_m^x} + \tilde{\delta}_1(L)x_{1T_m^x} + \dots + \tilde{\delta}_N(L)x_{NT_m^x}, \quad (16)$$

where the polynomials $\tilde{c}(Z) = \tilde{c}_1L^m + \dots + \tilde{c}_cL^{mc}$ and $\tilde{\delta}_i(L)$ are obtained by projecting y_{t_m} on information dated $mt_m - m$ or earlier, for $t = 1, 2, \dots, T_m^x$. In general, the direct approach of Equation (16) can also be extended to construct h_m -step ahead forecasts given information in T_m^x :

$$\bar{y}_{T_m^x+h_m|T_m^x} = \bar{c}(L^k)y_{T_m^x} + \bar{\delta}_1(L)x_{1T_m^x} + \dots + \bar{\delta}_N(L)x_{NT_m^x}, \quad (17)$$

where the polynomials $\bar{c}(Z)$ and $\bar{\delta}_i(L)$ are obtained by projecting y_{t_m} on information dated $mt - h_m$ or earlier, for $t = 1, 2, \dots, T_m^x$.

2.4 Data, Outlier Corrections and Limitations

We focus on the EA and individual economies. To ensure consistency across our cases, we have organised a dataset of corresponding indicators for all economies. These include hard data (production, retail sales, unemployment, interest rates, equity, volatility, etc.) as well as soft data (surveys etc.). Table 1 provides a description of the series, the corresponding Eurostat table code and the stationarity transformation which is required by all methodologies. All predictors are expressed in monthly frequency whereas the GDP growth rate is expressed in quarterly frequency.

The GDP nowcasting in this project is executed at three estimation time points attempting to exploit the different information available across time. These estimation points are: (i) about a month prior to the reference date, T-30, (ii) on the reference date, T, and (iii) two weeks after the reference date, T+15. At each estimation point, nowcasting estimates from 70 individual models (as discussed in the next section).

We also consider an outlier correction approach. In particular, we transform the target variable to stationarity and then define as outliers each value which is 3 standard deviations away from the median. Then, for each identified outlier, a dummy variable is created taking the value 1 on the indicated outlier date and 0 otherwise. This set of dummies is then inserted into the predictive regression used in the nowcasting. As this correction does not significantly improve on the standard estimates, the corresponding results can be found in Appendices B1 and B2.

2.5 Models

Based on the discussion of the previous sections, we now provide the details of the resulting models based on three characteristics: (i) different groups of variables, (ii) different methodologies and (iii) different mixed-frequency settings. These models can be listed in Table 2.

2.5.1 DFA Models

First, we start with DFA model variants. A DFA model is described by three orders: r which denotes the number of extracted factors from the set of predictors, q which denotes the number of shocks in the dynamic factor equation and p which denotes the order of the VAR in the factor equation; i.e. (r,q,p) . We have the following settings:

- $(r,q,p)=(1,1,1)$, ad-hoc choice,
- $(r,q,p)=(2,2,1)$, ad-hoc choice,
- (r,q,p) chosen automatically as the smallest order of the minimisation of three information criteria.

The information criteria are adaptations of Bai and Ng (2002) and Bai and Ng (2003) and are as follows:

$$\begin{aligned} IC_1(r, q, p) &= \ln \tilde{\sigma}^2 + r \left(\frac{N+T}{NT} \right) \ln \left(\frac{N+T}{NT} \right) \\ IC_2(r, q, p) &= \ln \tilde{\sigma}^2 + r \left(\frac{N+T}{NT} \right) \ln (\min(N, T)) \\ IC_3(r, q, p) &= \ln \tilde{\sigma}^2 + r \ln \left(\frac{\ln (\min(N, T))}{\min(N, T)} \right) \end{aligned}$$

Where $\tilde{\sigma}^2$ can either be the variance of the residuals or the uncertainty of the predictions. We build models using both settings. Next, we can combine the above models with:

- Hard data only (HD),
- Soft data only (SD),
- Hard and Soft data (HD,SD),
- Selected variables from the Hard and Soft data (HD,SD - OCMT) using the One Covariate at

a Time, Multiple Testing approach of Chudik, Kapetanios and Pesaran (2018). Under this approach, the information of each predictor is assessed in the first step, and a DFA model extracting factors out of the selected predictors is constructed.

Then, to solve the problem of mixed-frequency when dealing with our quarterly target and monthly predictors we use:

- Bridge equation (using the last month of each quarter),
- UMIDAS (translating each high frequency variable to its low frequency counterparts splitting the first, second and third month of each quarter to different subindicators).

A combination of all the above leads to 28 DFA model variants; see Table 2 for more details.

2.5.2 PCA and PLS

Next, we extract factors using static PCA and PLS. In this case we need to consider the number of factors as:

- determined by cross-validation,
- selected according the 90 % of the explained variance.

As before, we combine the above models with:

- Hard data only (HD),
- Soft data only (SD),
- Hard and Soft data (HD,SD),
- Bridge equation (using the last month of each quarter),
- UMIDAS.

The above leads to 12 PCA and 12 PLS cases; see Table 2 for more details.

2.5.3 Sparse Regressions

In our sparse regressions we also consider estimations which include:

- Hard data only (HD),
- Soft data only (SD),
- Hard and Soft data (HD,SD),

combined with:

- Bridge equation (using the last month of each quarter),
- UMIDAS.

3

Evaluation criteria and model averages

3.1 Criteria

Our methodological suite includes 70 models which can be evaluated over the past 12 quarters: from 2021Q4 to 2024Q3 at estimation points $T - 30$, T , and $T + 15$. In our evaluation we use a double-sorted filter as follows:

- First, we filter the individual models choosing those which have a $CONC \geq 80\%$. In case the threshold of 80 % is not applicable we use 60 % or lower (this is provided in the tables in Appendices A1 and B1).
- Then, we rank them according to their MAE. The above statistics are defined as follows.

$$MAE_M = \frac{1}{T} \sum_{t=1}^T |y_t - \hat{y}_t| \quad (18)$$

for T out-of-sample estimates of a given model, Model M . $\hat{y}_t$ denotes the estimate and y_t the observed value.

$$CONC_M = \frac{1}{T} \sum_{t=1}^T I[\text{sgn}(y_t) = \text{sgn}(\hat{y}_t)] \quad (19)$$

for T out-of-sample estimates of Model M . $\text{sgn}(\cdot)$ denotes the sign function and $I[\cdot]$ is an indicator variable taking 1 when the sign of the estimate, $\hat{y}_t$ is equal to the sign of the observed value, y_t

We further calculate the DM statistic for predictive accuracy as follows:

$$DM = \frac{\bar{d}}{(\widehat{LRV}_{\bar{d}}/T)^{1/2}}$$

where

$$\bar{d} = \frac{1}{T} \sum_{t=1}^T d_t$$

$$d_t = e_{1,t}^2 - e_{2,t}^2$$

$$LRV_{\bar{d}} = \gamma_0 + 2 \sum_{j=1}^{\infty} \gamma_j, \gamma_j = \text{cov}(d_t, d_{t-j})$$

for candidate models 1 and 2. The null hypothesis states equal predictive ability between models. In the tables we report the p-value of the test. In particular, we report the Harvey et al. (1997) modification to account for the small out-of-sample size.

We need to clarify that we always compare each candidate model against the AR(1) benchmark and not against each other. Also, in short evaluation samples, as the one used in this report, it is difficult for the test to reject the null hypothesis of model equivalence (even after using the Harvey et al., 1997, modification).

3.2 Model Averages

We further complement the individual models by using model averages. We consider the following types of model averages:

- Static Model Averages: assigning equal weight to all models of the same methodology.
- Dynamic Model Averages (MAE): assigning equal weights to the Top 5, Top 10, Top 20 and Top 50 models ranked according to their MAE over the past 4 quarters.
- Dynamic Model Averages (CONC): assigning equal weights to the Top 5, Top 10, Top 20 and Top 50 models ranked first according to their CONC and then according to their MAE over the past 4 quarters.

However, it is important to notice that the above model averages were effective in 2024 and, consequently, they will be evaluated only for three quarters: 2024Q1 to 2024Q3.

4

Discussion results

This section presents an overview of the performance of the individual models and the corresponding model averages in four synthetic tables; Table 3 to Table 7. Given that the outliers correction does not significantly improve the results, we have included them in a separate appendix. Detailed results for individual models and model averages with and without the outliers correction are provided in the Appendices A1, A2, B1 and B2.

4.1 Individual Models

We start our discussion focusing on the individual models; all detailed results can be found in Appendix A1. Table 3 provides a synthetic overview of the top models which have scored 80 % and above in the CONC and have the best MAE. These results are provided for each estimation point, $T - 30$, T , $T + 15$, as well as averaged across all estimation points (ALL). Table 4 illustrates in a more comprehensive way the best model for each case. Table 5 provides the actual value and the nowcasts of the best individual models described in Table 4.

Starting with the EA, we see that the best model for $T - 30$ is Model 63, for T is Model 64, for $T + 15$ is Model 57/69 and across all estimation points is Model 63. These are Lasso, Ridge and Elastic Net models, indicating that across the past 12 quarters, penalised regression-based nowcasting works better for the EA.

Continuing with the case of BE, we see that the best model for $T - 30$ is Model 14, for T is Model 55, for $T + 15$ is Model 63 and across all estimation points is Model 63. These are DFA, Lasso and Ridge models; Ridge with UMIDAS (Model 63) has the best overall performance across the past 12 quarters.

Next, we have the case of DE, we see that the best model for $T - 30$ is AR(1), for T is Model 29, for $T + 15$ is Model 70 and across all estimation points is Model 57; these are AR(1), DFA, Lasso and Elastic Net models. Again, we see that -overall- penalised regression works better for the EA.

For the case of ES, we see that the best model for $T - 30$ is Model 51, for T is Model 25, for $T + 15$ is Model 55 and across all estimation points is Model 65; these are PLS, DFA, Lasso and

Elastic Net models. In this case we see that, overall, penalised regression works better (across estimation points) but factor models are better at earlier estimation points ($T - 30$ and T).

For the case of FR, we see that the best model for $T - 30$ is Model 61, for T is Model 60, for $T + 15$ is Model 69 and across all estimation points is Model 60; these are Ridge and Elastic Net indicating again the suitability of penalised regressions.

For the case of IT, we see that the best model for $T - 30$ is Model 49, for T is Model 41, for $T + 15$ is Model 38 and across all estimation points is Model 49. These are PCA and PLS models showing some rare evidence, compared to above, in favour of factor models.

Finally, for the case of NL, we see that the best model for $T - 30$ is Model 56, for T is Model 65, for $T + 15$ is Model 25 and across all estimation points is Model 25. These are Lasso, Elastic Net and DFA models showing that, overall, factor models work better (across estimation points) but penalised models are better at earlier estimation points ($T - 30$ and T).

4.2 Model Averages

Turning our attention to Table 6 and Table 7, one can compare the results using the model averages. Table 8 provides the actual value and the nowcasts of the best model averages described in Table 7. Of course, it is important to notice that these results are evaluated only across 3 quarters (2024Q1 to 2024Q3); therefore, the researcher should be cautious when generalising conclusions based on this empirical evidence.

Starting with the EA, we see that the best model for $T-30$ is Dynamic-EA, MAE- Top25, for T , $T + 15$ and Overall is the Dynamic-EA, CONC-Top5 showing empirical evidence in favour of the double-sorted filter. The Dynamic-Cou, CONC-Top50 is the best model for BE across all estimation points as well as for ES. The Dynamic- EA, MAE-Top10 seems to work better for DE, but the Dynamic-EA, CONC-Top10 is a better choice for FR. For IT we have sparse results favouring Dynamic-EA, CONC-Top5 for $T - 30$, Dynamic-EA, CONC-Top10 for T , Dynamic-EA, MAE-Top5 for $T + 15$ and Dynamic-EA, MAE-Top25 across all estimation points. Dynamic-Cou, CONC-Top25 and Dynamic-EA, CONC-Top25 are better for NL.

5

Concluding remarks

This paper is concerned with the nowcasting of the EA and six major EU economies; BE, DE, ES, FR, IT and NL. It is important to notice that the estimates employed here are those obtained in real-time in 30 days prior to the target data ($T - 30$), on the target date (T) and 15 days past the target date ($T + 15$). The models were based on the authors constant effort to further improve existing models and include an approach for outliers correction as well as various model averages (as discussed in the next sections). For that reason, the individual models are evaluated over 12 quarters whereas the model averages are evaluated only over the past 3 quarters (due to the fact that these averages were considered much later than the individual models).

Overall, the empirical results present some heterogeneity across the various cases, however there is evidence that penalised regression work better for EA, BE, DE, ES and FR, whereas factor models seem to work better for IT and NL. The model averages with the double-sorted filter also provide some encouraging results, however the evaluation period is too short to generalise this argument.

6

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7

Tables

Table 1

Variables used

Transformations: 0 (no transformation), 1 (period-to-period percentage change), 2 (first order difference)

Series	Estat Table	Transf	Label	New
Production in industry - monthly data	sts inpr m	1	HD1	
Euro area 19 international trade [EXPORTS] - monthly data	ei etea19 m	1	HD2	
Euro area 19 international trade [IMPORTS] - monthly data	ei etea19 m	1	HD3	
Production in construction - monthly data	sts copr m	1	HD4	
Unemployment Rate	une rt m	2	HD5	
Money market interest rates [3 MONTH YIELD] - monthly data	irt st m	2	HD6	
Euro yield curves [10 YEAR YIELD] - monthly data	irt euryld m	2	HD7	New
Turnover and volume of sales in wholesale and retail trade - monthly data (Retail Sales)	sts trtu m	1	HD8	
Euro/ECU [USD] exchange rates - monthly data	ert bil eur m	1	HD9	
Spread [10Y - 3M = HD7 - HD6]	ert bil eur m	0	HD12	New
Production development observed over the past 3 months [Industry]	ei bsin m r2	2	SD1	New
Production expectations over the next 3 months [Industry]	ei bsin m r2	2	SD2	
Employment expectations over the next 3 months [Industry]	ei bsin m r2	2	SD3	

Series	Estat Table	Transf	Label	New
Assessment of order-book levels [Industry]	ei bsin m r2	2	SD4	
Assessment of export order-book levels [Industry]	ei bsin m r2	2	SD5	
Assessment of the current level of stocks of finished products [Industry]	ei bsin m r2	2	SD6	New
Building activity development over the past 3 months [Construction]	ei bsbu m r2	2	SD7	
Evolution of the current overall order books [Construction]	ei bsbu m r2	2	SD8	New
Employment expectations over the next 3 months [Construction]	ei bsbu m r2	2	SD9	
Price expectations over the next 3 months [Construction]	ei bsbu m r2	2	SD10	New
Business activity (sales) development over the past 3 months [Retail]	ei bsrt m r2	2	SD11	
Volume of stocks currently hold [Retail]	ei bsrt m r2	2	SD12	
Expectations of the number of orders over the next 3 months [Retail]	ei bsrt m r2	2	SD13	New
Business activity expectations over the next 3 months [Retail]	ei bsrt m r2	2	SD14	New
Employment expectations over the next 3 months [Retail]	ei bsrt m r2	2	SD15	
Business Situation over the past 3 months [Services]	ei bsse m r2	2	SD16	New
Evolution of Demand over the past 3 months [Services]	ei bsse m r2	2	SD17	New
Expectation of Demand over the next 3 months [Services]	ei bsse m r2	2	SD18	New
Evolution of Employment over the past 3 months [Services]	ei bsse m r2	2	SD19	New
Expectation of Employment over the next 3 months [Services]	ei bsse m r2	2	SD20	New
Euro-zone Business Climate Indicator - monthly data	ei bsci m r2	2	SD21	New
Construction confidence indicator	ei bssi m r2	2	SD22	
Economic sentiment indicator	ei bssi m r2	1	SD23	
Industrial confidence indicator	ei bssi m r2	2	SD24	

Series	Estat Table	Transf	Label	New
Retail Confidence Indicator	ei bssi m r2	2	SD25	New
Consumer Confidence Indicator	ei bssi m r2	2	SD26	New
Financial situation over the last 12 Months [Consumer]	ei bsco m	2	SD27	New
Financial situation over next 12 Months [Consumer]	ei bsco m	2	SD28	
General economic situation over the last 12 months [Consumer]	ei bsco m	2	SD29	New
General economic situation over the next 12 months [Consumer]	ei bsco m	2	SD30	
Price Trends over the last 12 months [Consumer]	ei bsco m	2	SD31	New
Price Trends over the next 12 months [Consumer]	ei bsco m	2	SD32	New
Unemployment Expectations over the next 12 months [Consumer]	ei bsco m	2	SD33	New
Major purchases over next 12 months [Consumer]	ei bsco m	2	SD34	
Savings over the next 12 months [Consumer]	ei bsco m	2	SD35	
GDP and main components (chain linked volumes (2010), mill. eur)	namq 10 gdp	1	Y	

Table 2

Various Models

ID	Methodology	Mixed-Frequency	Data Group	Extra Information	ID	Methodology	Mixed-Frequency	Data Group	Extra Information
Model1	DFA	3rd Month	HD	min(IC res)	Model35	PCA	UMIDAS	HD	CV
Model2	DFA	3rd Month	HD	min(IC for)	Model36	PCA	UMIDAS	HD	90 % of Var
Model3	DFA	3rd Month	SD	min(IC res)	Model37	PCA	UMIDAS	SD	CV
Model4	DFA	3rd Month	SD	min(IC for)	Model38	PCA	UMIDAS	SD	90 % of Var
Model5	DFA	3rd Month	HD, SD	min(IC res)	Model39	PCA	UMIDAS	HD, SD	CV
Model6	DFA	3rd Month	HD, SD	min(IC for)	Model40	PCA	UMIDAS	HD, SD	90 % of Var
Model7	DFA	3rd Month	HD, SD - OCMT	min(IC res)	Model41	PLS	3rd Month	HD	CV
Model8	DFA	3rd Month	HD, SD - OCMT	min(IC for)	Model42	PLS	3rd Month	HD	90 % of Var
Model9	DFA	3rd Month	HD	(1,1,1)	Model43	PLS	3rd Month	SD	CV
Model10	DFA	3rd Month	HD	(2,2,1)	Model44	PLS	3rd Month	SD	90 % of Var
Model11	DFA	3rd Month	SD	(1,1,1)	Model45	PLS	3rd Month	HD, SD	CV
Model12	DFA	3rd Month	SD	(2,2,1)	Model46	PLS	3rd Month	HD, SD	90 % of Var
Model13	DFA	3rd Month	HD, SD	(1,1,1)	Model47	PLS	UMIDAS	HD	CV
Model14	DFA	3rd Month	HD, SD	(2,2,1)	Model48	PLS	UMIDAS	HD	90 % of Var
Model15	DFA	UMIDAS	HD	min(IC res)	Model49	PLS	UMIDAS	SD	CV
Model16	DFA	UMIDAS	HD	min(IC for)	Model50	PLS	UMIDAS	SD	90 % of Var
Model17	DFA	UMIDAS	SD	min(IC res)	Model51	PLS	UMIDAS	HD, SD	CV
Model18	DFA	UMIDAS	SD	min(IC for)	Model52	PLS	UMIDAS	HD, SD	90 % of Var
Model19	DFA	UMIDAS	HD, SD	min(IC res)	Model53	LASSO	3rd Month	HD	
Model20	DFA	UMIDAS	HD, SD	min(IC for)	Model54	LASSO	3rd Month	SD	
Model21	DFA	UMIDAS	HD, SD - OCMT	min(IC res)	Model55	LASSO	3rd Month	HD, SD	
Model22	DFA	UMIDAS	HD, SD - OCMT	min(IC for)	Model56	LASSO	UMIDAS	HD	
Model23	DFA	UMIDAS	HD	(1,1,1)	Model57	LASSO	UMIDAS	SD	
Model24	DFA	UMIDAS	HD	(2,2,1)	Model58	LASSO	UMIDAS	HD, SD	
Model25	DFA	UMIDAS	SD	(1,1,1)	Model59	RIDGE	3rd Month	HD	

ID	Methodology	Mixed-Frequency	Data Group	Extra Information	ID	Methodology	Mixed-Frequency	Data Group	Extra Information
Model26	DFA	UMIDAS	SD	(2,2,1)	Model60	RIDGE	3rd Month	SD	
Model27	DFA	UMIDAS	HD, SD	(1,1,1)	Model61	RIDGE	3rd Month	HD, SD	
Model28	DFA	UMIDAS	HD, SD	(2,2,1)	Model62	RIDGE	UMIDAS	HD	
Model29	PCA	3rd Month	HD	CV	Model63	RIDGE	UMIDAS	SD	
Model30	PCA	3rd Month	HD	90 % of Var	Model64	RIDGE	UMIDAS	HD, SD	
Model31	PCA	3rd Month	SD	CV	Model65	EN	3rd Month	HD	
Model32	PCA	3rd Month	SD	90 % of Var	Model66	EN	3rd Month	SD	
Model33	PCA	3rd Month	HD, SD	CV	Model67	EN	3rd Month	HD, SD	
Model34	PCA	3rd Month	HD, SD	90 % of Var	Model68	EN	UMIDAS	HD	
					Model69	EN	UMIDAS	SD	
					Model70	EN	UMIDAS	HD, SD	

Table 3

MAE and DM p-value for individual models

Evaluation period: 2021Q4 - 2024Q3

		Model8	Model11	Model12	Model14	Model16	Model19	Model25	Model26	Model27	Model28	Model29	Model38	Model41	Model49	Model51	Model55	Model56	Model57	Model60	Model61	Model63	Model64	Model65	Model69	Model70	AR(1)
	MAE	0.659	0.157	0.649	0.687	0.609	0.437	0.310	0.515	0.295	0.499	0.752	0.534	0.644	0.360	0.244	0.286	0.539	0.277	0.243	0.178	0.147	0.164	0.334	0.247	0.327	0.259
	T-30 DM	0.062	0.213	0.181	0.158	0.078	0.256	0.627	0.138	0.726	0.139	0.078	0.114	0.096	0.433	0.895	0.809	0.005	0.875	0.861	0.326	0.193	0.216	0.528	0.894	0.550	
	T MAE	0.764	0.146	0.857	0.646	0.458	0.245	0.290	0.631	0.294	0.574	0.383	0.716	0.345	0.454	0.313	0.251	0.535	0.147	0.622	0.326	0.148	0.140	0.225	0.150	0.270	0.228
EA	DM	0.017	0.067	0.193	0.143	0.017	0.842	0.507	0.013	0.447	0.014	0.197	0.011	0.140	0.104	0.275	0.721	0.024	0.095	0.080	0.472	0.101	0.076	0.958	0.106	0.561	
	T+15 MAE	0.755	0.144	0.861	0.757	0.887	0.243	0.304	0.641	0.353	0.537	0.474	0.882	0.476	0.462	0.390	0.397	0.403	0.144	0.661	0.324	0.145	0.146	0.242	0.144	0.319	0.231
	DM	0.013	0.058	0.187	0.127	0.004	0.893	0.440	0.011	0.071	0.015	0.039	0.004	0.011	0.076	0.228	0.147	0.099	0.078	0.052	0.388	0.079	0.085	0.842	0.078	0.215	
	MAE	0.726	0.149	0.789	0.697	0.651	0.308	0.301	0.596	0.314	0.537	0.537	0.711	0.488	0.425	0.315	0.312	0.492	0.189	0.509	0.276	0.147	0.150	0.267	0.180	0.305	0.240
	ALL DM	0.000	0.007	0.020	0.008	0.000	0.283	0.251	0.000	0.121	0.000	0.005	0.000	0.003	0.012	0.224	0.195	0.000	0.228	0.013	0.557	0.009	0.007	0.546	0.114	0.174	
	MAE	0.502	0.127	0.121	0.118	0.190	0.517	0.408	0.353	0.413	0.354	0.476	0.624	0.173	0.310	0.256	0.199	0.251	0.145	0.152	0.224	0.129	0.166	0.300	0.145	0.191	0.353
T-30	DM	0.407	0.015	0.011	0.010	0.067	0.213	0.726	1.000	0.704	0.994	0.408	0.254	0.065	0.639	0.299	0.157	0.314	0.021	0.028	0.285	0.015	0.043	0.661	0.021	0.096	
	T MAE	0.860	0.203	0.152	0.166	0.207	0.532	0.710	0.753	0.619	0.605	0.311	0.994	0.263	0.480	0.349	0.119	0.127	0.144	0.137	0.128	0.141	0.149	0.258	0.145	0.136	0.335
	DM	0.008	0.068	0.000	0.000	0.002	0.097	0.023	0.017	0.067	0.022	0.736	0.011	0.316	0.238	0.875	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.350	0.000	0.000	
BE	T+15 MAE	0.905	0.202	0.150	0.162	0.272	0.586	0.629	0.768	0.571	0.448	0.395	1.145	0.137	0.596	0.439	0.138	0.132	0.145	0.140	0.135	0.132	0.145	0.242	0.145	0.145	0.346
	DM	0.001	0.041	0.000	0.000	0.100	0.037	0.071	0.016	0.197	0.213	0.587	0.013	0.000	0.105	0.431	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.112	0.000	0.000	
	MAE	0.756	0.177	0.141	0.149	0.223	0.545	0.583	0.625	0.534	0.469	0.394	0.921	0.191	0.462	0.348	0.152	0.170	0.145	0.143	0.162	0.134	0.153	0.267	0.145	0.157	0.345
ALL	DM	0.000	0.000	0.000	0.000	0.000	0.003	0.008	0.003	0.036	0.056	0.411	0.000	0.000	0.099	0.954	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.129	0.000	0.000	
	MAE	0.583	0.411	0.556	0.556	0.719	0.750	0.584	0.629	0.561	0.614	0.486	0.902	0.530	0.878	0.572	0.456	0.492	0.312	0.333	0.414	0.504	0.514	0.427	0.361	0.396	0.306
	T-30 DM	0.106	0.161	0.165	0.143	0.010	0.040	0.109	0.089	0.110	0.093	0.100	0.026	0.139	0.021	0.101	0.120	0.171	0.962	0.748	0.265	0.129	0.107	0.291	0.635	0.480	
T	MAE	0.752	0.361	0.778	0.705	0.639	0.437	0.496	0.807	0.502	0.716	0.342	0.735	0.427	0.779	0.650	0.433	0.413	0.361	0.406	0.441	0.367	0.358	0.438	0.360	0.356	0.388
	DM	0.048	0.395	0.226	0.232	0.006	0.482	0.374	0.023	0.344	0.033	0.365	0.104	0.556	0.040	0.163	0.661	0.674	0.379	0.874	0.615	0.566	0.359	0.316	0.367	0.392	
	T+15 MAE	0.609	0.362	0.790	0.720	1.156	0.395	0.488	0.793	0.605	0.659	0.397	0.610	0.477	0.556	0.443	0.365	0.455	0.366	0.464	0.500	0.364	0.362	0.361	0.366	0.355	0.409
DE	DM	0.179	0.152	0.221	0.227	0.006	0.868	0.477	0.030	0.149	0.079	0.809	0.235	0.242	0.093	0.680	0.533	0.500	0.159	0.645	0.459	0.153	0.139	0.249	0.165	0.153	
	MAE	0.648	0.378	0.708	0.660	0.838	0.527	0.523	0.743	0.556	0.663	0.408	0.749	0.478	0.738	0.555	0.418	0.453	0.346	0.401	0.452	0.412	0.411	0.409	0.362	0.369	0.368
	ALL DM	0.003	0.728	0.027	0.024	0.000	0.050	0.044	0.000	0.015	0.001	0.350	0.002	0.052	0.000	0.027	0.323	0.104	0.566	0.570	0.163	0.341	0.340	0.337	0.887	0.982	
	MAE	0.864	0.579	0.617	0.613	0.639	1.108	0.843	0.956	0.815	0.949	1.138	1.379	0.789	0.444	0.433	0.505	0.692	0.494	0.502	0.493	0.501	0.500	0.464	0.498	0.523	0.501

			Model8	Model11	Model12	Model14	Model16	Model19	Model25	Model26	Model27	Model28	Model29	Model38	Model41	Model49	Model51	Model55	Model56	Model57	Model60	Model61	Model63	Model64	Model65	Model69	Model70	AR(1)		
	T-30	DM		0.238	0.511	0.273	0.222	0.230	0.043	0.260	0.192	0.281	0.192	0.026	0.046	0.134	0.664	0.575	0.981	0.285	0.952	0.993	0.944	0.999	0.994	0.745	0.979	0.891		
	T	MAE		0.542	0.558	0.464	0.504	0.871	0.825	0.434	0.716	0.440	0.684	0.664	1.032	0.752	1.148	1.185	0.533	0.494	0.495	0.495	0.486	0.496	0.492	0.492	0.496	0.481	0.462	
		DM		0.592	0.296	0.984	0.690	0.122	0.087	0.909	0.380	0.922	0.361	0.039	0.054	0.048	0.005	0.008	0.552	0.766	0.769	0.769	0.831	0.768	0.788	0.798	0.767	0.862		
ES	T+15	MAE		0.494	0.549	0.468	0.563	0.896	0.793	0.460	0.737	0.414	0.642	0.956	1.206	0.534	1.473	1.549	0.395	0.443	0.497	0.497	0.486	0.497	0.492	0.405	0.497	0.474	0.427	
		DM		0.631	0.303	0.664	0.311	0.049	0.085	0.889	0.268	0.952	0.290	0.004	0.011	0.300	0.001	0.000	0.660	0.839	0.408	0.411	0.472	0.411	0.445	0.786	0.408	0.575		
		MAE		0.633	0.562	0.516	0.560	0.802	0.909	0.579	0.803	0.557	0.758	0.919	1.206	0.692	1.022	1.056	0.477	0.543	0.495	0.498	0.488	0.498	0.495	0.454	0.497	0.493	0.463	
	ALL	DM		0.153	0.106	0.342	0.118	0.005	0.001	0.434	0.046	0.495	0.049	0.000	0.000	0.007	0.000	0.000	0.825	0.267	0.595	0.559	0.673	0.563	0.598	0.867	0.574	0.663		
		MAE		0.965	0.231	0.743	0.679	0.322	0.471	0.514	0.633	0.487	0.604	0.858	0.786	0.756	0.169	0.344	0.432	0.442	0.532	0.167	0.154	0.197	0.203	0.221	0.526	0.461	0.324	
	T-30	DM		0.003	0.403	0.152	0.074	0.991	0.382	0.226	0.045	0.295	0.066	0.045	0.099	0.084	0.229	0.896	0.343	0.502	0.050	0.067	0.098	0.226	0.265	0.430	0.125	0.264		
	T	MAE		0.688	0.196	0.802	0.746	0.331	0.310	0.365	0.577	0.349	0.478	0.425	0.672	0.543	0.528	0.477	0.206	0.389	0.178	0.172	0.192	0.182	0.180	0.211	0.173	0.252	0.223	
		DM		0.062	0.240	0.191	0.096	0.137	0.343	0.054	0.024	0.047	0.041	0.173	0.008	0.034	0.024	0.015	0.613	0.169	0.407	0.235	0.344	0.213	0.204	0.836	0.318	0.766		
	FR	T+15	MAE		0.682	0.202	0.840	0.792	0.483	0.275	0.352	0.531	0.324	0.355	0.493	0.785	0.587	0.675	0.507	0.185	0.457	0.169	0.171	0.181	0.183	0.183	0.193	0.169	0.313	0.224
		DM		0.060	0.330	0.169	0.078	0.008	0.478	0.054	0.033	0.102	0.126	0.060	0.003	0.014	0.004	0.024	0.145	0.027	0.291	0.167	0.124	0.119	0.119	0.326	0.253	0.263		
		MAE		0.778	0.210	0.795	0.739	0.379	0.352	0.410	0.580	0.387	0.479	0.592	0.748	0.628	0.457	0.443	0.274	0.429	0.293	0.170	0.176	0.187	0.189	0.208	0.289	0.342	0.257	
	ALL	DM		0.000	0.201	0.015	0.002	0.047	0.147	0.010	0.000	0.023	0.001	0.002	0.000	0.000	0.018	0.012	0.666	0.024	0.415	0.009	0.025	0.055	0.068	0.302	0.516	0.129		
		MAE		0.927	0.356	0.459	0.456	0.432	0.956	0.505	0.552	0.513	0.594	0.577	0.978	0.350	0.303	0.356	0.316	0.322	0.317	0.317	0.316	0.315	0.315	0.385	0.317	0.317	0.454	
	T-30	DM		0.282	0.319	0.977	0.992	0.829	0.036	0.766	0.593	0.711	0.460	0.536	0.144	0.209	0.157	0.396	0.088	0.171	0.092	0.091	0.090	0.089	0.086	0.591	0.093	0.083		
	T	MAE		0.521	0.331	0.441	0.439	0.386	0.959	0.505	0.662	0.499	0.636	0.311	0.460	0.256	0.304	0.348	0.317	0.292	0.315	0.316	0.318	0.315	0.318	0.330	0.315	0.314	0.355	
		DM		0.193	0.707	0.611	0.623	0.593	0.096	0.356	0.046	0.333	0.066	0.585	0.543	0.216	0.429	0.919	0.438	0.158	0.417	0.420	0.454	0.407	0.452	0.607	0.418	0.410		
	IT	T+15	MAE		0.562	0.341	0.440	0.438	0.322	0.987	0.507	0.764	0.430	0.705	0.546	0.288	0.491	0.313	0.347	0.319	0.318	0.318	0.317	0.319	0.318	0.320	0.320	0.318	0.319	0.343
		DM		0.326	0.972	0.595	0.605	0.823	0.039	0.314	0.013	0.474	0.023	0.124	0.478	0.399	0.589	0.963	0.576	0.546	0.542	0.532	0.573	0.547	0.588	0.581	0.543	0.578		
		MAE		0.670	0.343	0.447	0.444	0.380	0.967	0.505	0.659	0.481	0.645	0.478	0.575	0.365	0.307	0.351	0.317	0.310	0.317	0.317	0.318	0.316	0.318	0.345	0.317	0.317	0.384	
	ALL	DM		0.080	0.330	0.519	0.541	0.933	0.001	0.184	0.004	0.225	0.005	0.248	0.150	0.784	0.079	0.493	0.048	0.046	0.045	0.044	0.050	0.043	0.049	0.393	0.045	0.043		
		MAE		0.665	0.745	0.751	0.775	0.772	0.718	0.687	0.668	0.692	0.678	0.694	0.711	0.944	0.679	0.721	0.706	0.584	0.752	0.677	0.701	0.695	0.676	0.598	0.737	0.780	0.831	
	T-30	DM		0.379	0.420	0.438	0.569	0.708	0.489	0.312	0.308	0.334	0.327	0.275	0.494	0.568	0.384	0.543	0.396	0.100	0.581	0.164	0.217	0.271	0.207	0.178	0.526	0.701		
	T	MAE		0.650	0.693	0.724	0.836	0.783	0.630	0.707	0.616	0.723	0.628	0.847	0.867	0.725	0.754	0.839	0.607	0.598	0.721	0.703	0.696	0.680	0.743	0.584	0.702	0.685	0.776	
		DM		0.407	0.238	0.430	0.728	0.944	0.386	0.627	0.343	0.698	0.344	0.453	0.546	0.548	0.822	0.614	0.192	0.132	0.560	0.530	0.381	0.276	0.641	0.168	0.439	0.427		
NL	T+15	MAE		0.641	0.692	0.725	0.817	0.807	0.581	0.634	0.551	0.658	0.581	0.823	0.783	0.707	0.737	0.704	0.790	0.699	0.681	0.746	0.818	0.685	0.763	0.690	0.668	0.691	0.781	
		DM		0.349	0.187	0.398	0.814	0.769	0.251	0.316	0.173	0.365	0.175	0.718	0.992	0.255	0.678	0.446	0.947	0.344	0.212	0.723	0.673	0.250	0.784	0.415	0.186	0.357		

				Model8	Model11	Model12	Model14	Model16	Model19	Model25	Model26	Model27	Model28	Model29	Model38	Model41	Model49	Model51	Model55	Model56	Model57	Model60	Model61	Model63	Model64	Model65	Model69	Model70	AR(1)
		MAE		0.652	0.710	0.733	0.809	0.787	0.643	0.676	0.612	0.691	0.629	0.788	0.787	0.792	0.723	0.755	0.701	0.627	0.718	0.709	0.738	0.687	0.727	0.624	0.703	0.719	0.796
ALL	DM			0.113	0.062	0.158	0.872	0.885	0.101	0.131	0.044	0.171	0.049	0.896	0.920	0.954	0.318	0.594	0.207	0.012	0.198	0.148	0.275	0.048	0.172	0.031	0.134	0.227	

Table 4

Best individual model

Evaluation period: 2021Q4 - 2024Q3.

		Model8	Model12	Model14	Model16	Model19	Model25	Model26	Model27	Model28	Model29	Model38	Model41	Model49	Model51	Model55	Model56	Model57	Model60	Model61	Model63	Model64	Model65	Model69	Model7	AR(1)
EA	T-30 T T+15 ALL																	*			*		*			
BE	T-30 T T+15 ALL			*												*					*	*		*		
DE	T-30 T T+15 ALL										*								*						*	*
ES	T-30 T T+15 ALL						*								*			*					*			
FR	T-30 T T+15 ALL																		*	*				*		
IT	T-30 T T+15 ALL											*	*	*	*											
NL	T-30 T T+15 ALL								*	*							*						*			

Table 5

Detailed nowcasts and actual values for each of the best models described in Table 4
Evaluation period: 2021Q4 - 2024Q3.

	EA					BE					DE				
	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL
2021Q4	0.3	0.3	0.3	0.3	0.3	0.5	0.4	0.4	0.4	0.4	-0.7	-0.3	0.4	0.4	0.4
2022Q1	0.2	0.3	0.2	0.3	0.2	0.5	0.5	0.5	0.4	0.4	0.2	0.3	0.5	0.4	0.3
2022Q2	0.7	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.4	0.0	0.4	0.2	0.4	0.4
2022Q3	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.3	0.4	0.2	0.4	0.5
2022Q4	0.1	0.3	0.3	0.3	0.3	0.1	0.4	0.3	0.3	0.4	-0.2	0.4	0.4	0.3	0.3
2023Q1	0.1	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.3	0.4	0.0	0.2	0.2	0.3	0.1
2023Q2	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.3	0.0	0.3	0.1	0.3	0.3
2023Q3	0.0	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.4	-0.1	0.3	0.3	0.3	0.2
2023Q4	0.0	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.4	-0.3	0.3	0.3	0.3	0.1
2024Q1	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.2	0.3	0.1	0.3	0.2
2024Q2	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.4	0.4	0.3	0.0	0.4	0.3	0.2	0.3
2024Q3	0.4	0.3	0.3	0.3	0.3	0.2	0.4	0.4	0.4	0.4	0.2	0.4	0.2	0.3	0.3

	ES					FR					IT				
	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL
2021Q4	2.0	0.3	1.9	0.1	0.1	0.7	0.1	0.5	0.3	0.3	0.6	0.0	0.1	0.6	0.2
2022Q1	0.3	0.6	0.5	0.4	0.2	0.0	0.1	0.2	0.3	0.1	-0.2	0.0	0.0	-0.3	0.0
2022Q2	1.1	0.2	0.6	0.1	0.1	0.5	0.4	0.2	0.2	0.3	1.0	0.3	0.2	0.2	0.1
2022Q3	0.2	0.2	0.4	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.5	-0.2	0.7	0.1	-0.1
2022Q4	0.2	0.2	-0.8	0.2	0.2	0.1	0.2	0.3	0.2	0.2	-0.1	0.3	0.0	0.4	0.1
2023Q1	0.5	0.2	0.4	0.1	0.1	0.2	0.3	0.4	0.3	0.4	0.5	0.0	0.5	0.3	0.0
2023Q2	0.4	0.2	1.2	0.3	0.3	0.5	0.3	0.3	0.3	0.3	-0.3	-0.2	0.5	-0.5	0.0
2023Q3	0.3	0.5	0.6	0.5	0.7	0.1	0.3	0.3	0.1	0.3	0.0	0.1	0.3	-0.3	0.1
2023Q4	0.6	0.3	0.4	0.1	0.1	0.0	0.2	0.3	0.1	0.2	0.2	0.0	0.2	0.4	0.1
2024Q1	0.7	0.3	0.8	0.5	0.5	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	-0.3	0.1
2024Q2	0.8	0.7	1.0	0.7	0.5	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0
2024Q3	0.8	0.2	-0.7	0.6	0.5	0.4	0.2	0.2	0.1	0.2	0.0	0.1	0.0	0.1	0.1

NL					
	Actual	T-30	T	T+15	ALL
2021Q4	0.9	0.7	1.0	1.0	1.0
2022Q1	0.0	-0.1	0.3	0.1	0.4
2022Q2	2.6	0.7	1.0	0.3	0.3
2022Q3	-0.2	0.4	0.3	-0.2	-0.1
2022Q4	0.6	0.4	0.5	0.2	0.2
2023Q1	-0.7	0.7	1.2	0.3	0.4
2023Q2	-0.3	0.4	0.6	0.0	0.0
2023Q3	-0.2	0.4	0.3	-0.1	-0.1
2023Q4	0.2	0.0	-0.3	0.9	0.8
2024Q1	-0.3	-0.4	-0.4	0.0	0.5
2024Q2	1.0	0.5	0.9	0.4	0.5
2024Q3	0.8	0.3	0.3	0.1	0.2

Table 6**MAE and DM p-value for model averages***Evaluation period: 2024Q1 - 2024Q3*

			Dynamic- Cou, CONC- Top10	Dynami- c- Cou, CONC- Top25	Dynamic- Cou, CONC- Top5	Dynamic- Cou, CONC- Top50	Dynamic- EA, CONC- Top10	Dynamic- EA, CONC- Top25	Dynami- c- EA, CONC- Top5	Dynamic- EA, CONC- Top50	Dynamic- EA, MAE- Top10	Dynamic- EA, MAE- Top25	Dynamic- EA, MAE- Top5	Dynamic- EA, MAE- Top50	Static (All)	Static (DFA)	Static (EN)	Static (LASSO)	Static (PCA)	Static (PLS)	AR(1)
		MAE	0.159	0.363	0.159	0.279	0.184	0.363	0.042	0.363	0.386	0.042	0.152	0.179	0.262	0.152	0.117	0.123	0.095	0.095	0.109
	T-30	DM	0.538	0.130	0.538	0.124	0.487	0.130	0.161	0.130	0.187	0.160	0.714	0.505	0.278	0.714	0.923	0.770	0.552	0.552	
	T	MAE	0.237	0.228	0.237	0.337	0.247	0.228	0.043	0.228	0.238	0.043	0.180	0.233	0.099	0.180	0.066	0.095	0.071	0.071	0.187
		DM	0.740	0.873	0.740	0.582	0.737	0.873	0.465	0.873	0.883	0.465	0.977	0.772	0.692	0.977	0.370	0.609	0.575	0.575	
EA	T+15	MAE	0.220	0.330	0.249	0.330	0.285	0.395	0.038	0.330	0.371	0.039	0.107	0.246	0.109	0.107	0.060	0.046	0.070	0.070	0.241
		DM	0.876	0.638	0.957	0.631	0.825	0.533	0.286	0.638	0.492	0.289	0.464	0.977	0.134	0.464	0.187	0.211	0.368	0.368	
		MAE	0.205	0.307	0.215	0.315	0.239	0.329	0.041	0.307	0.332	0.041	0.146	0.219	0.157	0.146	0.081	0.088	0.078	0.078	0.179
	ALL	DM	0.659	0.197	0.536	0.142	0.434	0.164	0.067	0.197	0.207	0.068	0.712	0.541	0.778	0.712	0.099	0.187	0.190	0.190	
		MAE	0.607	0.288	0.500	0.064	0.181	0.288	0.173	0.288	0.298	0.176	0.173	0.178	0.915	0.173	0.923	0.923	0.986	1.001	0.760
	T-30	DM	0.824	0.273	0.664	0.112	0.206	0.273	0.202	0.273	0.256	0.204	0.202	0.203	0.541	0.202	0.545	0.545	0.343	0.356	
	T	MAE	0.953	0.269	0.686	0.113	0.171	0.269	0.162	0.269	0.282	0.162	0.148	0.171	0.775	0.148	0.518	0.518	0.600	1.065	0.615
		DM	0.489	0.390	0.854	0.223	0.299	0.390	0.299	0.390	0.340	0.299	0.267	0.298	0.682	0.267	0.711	0.711	0.954	0.029	
BE	T+15	MAE	1.208	0.298	0.900	0.127	0.160	0.298	0.157	0.298	0.225	0.157	0.150	0.162	0.914	0.150	0.247	0.247	0.308	0.962	0.288
		DM	0.064	0.963	0.105	0.321	0.572	0.963	0.568	0.963	0.857	0.570	0.557	0.570	0.183	0.557	0.865	0.865	0.942	0.155	
		MAE	0.923	0.285	0.695	0.101	0.171	0.285	0.164	0.285	0.268	0.165	0.157	0.170	0.868	0.157	0.563	0.563	0.631	1.009	0.554
	ALL	DM	0.211	0.125	0.554	0.012	0.039	0.125	0.038	0.125	0.105	0.038	0.033	0.038	0.095	0.033	0.944	0.944	0.528	0.006	
		MAE	0.377	0.386	0.412	0.353	0.298	0.386	0.175	0.386	0.205	0.175	0.166	0.276	0.255	0.166	0.395	0.440	0.502	0.502	0.376
	T-30	DM	0.996	0.961	0.887	0.915	0.702	0.961	0.408	0.961	0.354	0.407	0.381	0.673	0.659	0.381	0.968	0.511	0.292	0.292	
	T	MAE	0.415	0.296	0.432	0.380	0.229	0.296	0.173	0.296	0.208	0.173	0.190	0.215	0.275	0.190	0.383	0.664	0.695	0.695	0.743
		DM	0.346	0.264	0.389	0.503	0.221	0.264	0.165	0.264	0.139	0.165	0.156	0.205	0.212	0.156	0.539	0.759	0.851	0.851	
DE	T+15	MAE	0.486	0.364	0.495	0.491	0.291	0.648	0.178	0.364	0.110	0.177	0.185	0.265	0.163	0.185	0.427	0.481	0.527	0.527	0.714
		DM	0.479	0.304	0.503	0.704	0.283	0.909	0.179	0.304	0.158	0.178	0.207	0.257	0.146	0.207	0.626	0.476	0.548	0.548	
		MAE	0.426	0.349	0.446	0.408	0.273	0.443	0.175	0.349	0.174	0.175	0.180	0.252	0.231	0.180	0.402	0.529	0.575	0.575	0.611
	ALL	DM	0.207	0.101	0.273	0.360	0.049	0.407	0.012	0.101	0.010	0.012	0.012	0.039	0.026	0.012	0.418	0.483	0.756	0.756	
		MAE	1.102	0.473	1.102	0.211	0.895	0.473	0.937	0.473	0.325	0.937	0.441	0.901	0.937	0.441	1.016	1.016	1.036	0.937	1.057
	T-30	DM	0.274	0.442	0.274	0.289	0.736	0.442	0.833	0.442	0.178	0.834	0.237	0.753	0.833	0.237	0.680	0.680	0.716	0.834	
	T	MAE	0.902	0.378	0.902	0.226	0.903	0.378	0.903	0.378	0.590	0.907	0.628	0.912	0.903	0.628	0.959	0.959	0.986	0.907	0.963

			Dynamic- Cou, CONC- Top10	Dynamic- c- Cou, CONC- Top25	Dynamic- Cou, CONC- Top5	Dynamic- Cou, CONC- Top50	Dynamic- EA, CONC- Top10	Dynamic- EA, CONC- Top25	Dynamic- c- EA, CONC- Top5	Dynamic- EA, CONC- Top50	Dynamic- EA, MAE- Top10	Dynamic- EA, MAE- Top25	Dynamic- EA, MAE- Top5	Dynamic- EA, MAE- Top50	Static (All)	Static (DFA)	Static (EN)	Static (LASSO)	Static (PCA)	Static (PLS)	AR(1)
ES	T+15	DM	0.176	0.038	0.176	0.009	0.817	0.038	0.794	0.038	0.256	0.805	0.498	0.837	0.794	0.498	0.989	0.989	0.922	0.805	
		MAE	0.958	0.447	0.958	0.201	0.943	0.447	0.928	0.447	0.321	0.929	0.421	0.945	0.928	0.421	1.191	1.191	1.167	0.929	1.001
		DM	0.460	0.055	0.460	0.010	0.822	0.055	0.765	0.055	0.047	0.767	0.177	0.823	0.765	0.177	0.405	0.405	0.400	0.767	
		MAE	0.987	0.433	0.987	0.212	0.914	0.433	0.922	0.433	0.412	0.924	0.497	0.919	0.922	0.497	1.055	1.055	1.063	0.924	1.007
	ALL	DM	0.451	0.014	0.451	0.002	0.559	0.014	0.629	0.014	0.003	0.637	0.024	0.586	0.629	0.024	0.638	0.638	0.513	0.637	
		IAE	0.347	0.169	0.347	0.119	0.101	0.169	0.135	0.169	0.213	0.138	0.113	0.112	0.339	0.113	0.339	0.339	0.326	0.326	0.362
30	T	DM	0.957	0.138	0.957	0.211	0.334	0.138	0.359	0.138	0.196	0.368	0.215	0.370	0.933	0.215	0.933	0.933	0.892	0.892	
		MAE	0.420	0.328	0.420	0.248	0.084	0.328	0.067	0.328	0.339	0.066	0.116	0.101	0.180	0.116	0.180	0.180	0.194	0.194	0.809
FR	T+15	DM	0.096	0.141	0.096	0.064	0.019	0.141	0.037	0.141	0.181	0.037	0.071	0.019	0.124	0.071	0.124	0.124	0.121	0.121	
		MAE	0.566	0.267	0.566	0.155	0.054	0.226	0.064	0.226	0.347	0.063	0.190	0.088	0.244	0.190	0.244	0.244	0.241	0.241	0.614
		DM	0.925	0.399	0.925	0.381	0.184	0.390	0.209	0.390	0.551	0.210	0.317	0.174	0.492	0.317	0.492	0.492	0.487	0.487	
		MAE	0.444	0.255	0.444	0.174	0.080	0.241	0.089	0.241	0.300	0.089	0.140	0.100	0.254	0.140	0.254	0.254	0.254	0.254	0.595
	ALL	DM	0.385	0.023	0.385	0.017	0.003	0.024	0.005	0.024	0.064	0.006	0.009	0.003	0.101	0.009	0.101	0.101	0.095	0.095	
		MAE	0.757	0.213	0.849	0.169	0.471	0.213	0.118	0.213	0.334	0.118	0.173	0.490	0.698	0.173	0.464	0.254	0.175	0.294	0.483
	T-30	DM	0.281	0.004	0.185	0.165	0.941	0.004	0.006	0.004	0.226	0.005	0.014	0.970	0.490	0.014	0.902	0.218	0.027	0.269	
		MAE	0.451	0.209	0.495	0.218	0.068	0.205	0.183	0.209	0.244	0.181	0.134	0.068	0.157	0.134	0.611	0.587	0.347	0.675	0.312
IT	T+15	DM	0.609	0.549	0.303	0.619	0.071	0.525	0.489	0.549	0.635	0.476	0.265	0.072	0.056	0.265	0.582	0.488	0.911	0.413	
		MAE	0.598	0.164	0.264	0.183	0.167	0.187	0.163	0.187	0.283	0.158	0.151	0.192	0.211	0.151	0.294	0.415	0.475	0.513	0.324
		DM	0.066	0.294	0.445	0.325	0.278	0.420	0.438	0.420	0.712	0.416	0.396	0.399	0.216	0.396	0.838	0.810	0.665	0.681	
		MAE	0.602	0.195	0.536	0.190	0.235	0.201	0.155	0.203	0.287	0.152	0.152	0.250	0.355	0.152	0.456	0.419	0.332	0.494	0.373
	ALL	DM	0.037	0.016	0.113	0.047	0.069	0.024	0.020	0.027	0.149	0.018	0.008	0.134	0.861	0.008	0.602	0.780	0.774	0.515	
		MAE	1.219	0.570	1.219	0.692	0.639	0.570	0.657	0.570	0.602	0.657	0.628	0.640	0.657	0.628	0.869	0.869	0.836	0.657	0.718
	T-30	DM	0.259	0.744	0.259	0.802	0.621	0.744	0.760	0.744	0.761	0.759	0.753	0.639	0.760	0.753	0.657	0.657	0.758	0.759	
		MAE	0.814	0.610	0.814	0.827	0.803	0.610	0.724	0.610	0.735	0.726	0.749	0.801	0.724	0.749	1.200	1.200	1.182	0.726	0.828

			Dynamic- Cou, CONC- Top10	Dynami- c- Cou, CONC- Top25	Dynamic- Cou, CONC- Top5	Dynamic- Cou, CONC- Top50	Dynamic- EA, CONC - Top10	Dynamic- EA, CONC- Top25	Dynami- c- EA, CONC- Top5	Dynamic- EA, CONC- Top50	Dynamic- EA, MAE- - Top10	Dynamic- EA, MAE - Top25	Dynamic- EA, MAE - Top5	Dynamic- EA, MAE - Top50	Static (All)	Static (DFA)	Static (EN)	Static (LASSO)	Static (PCA)	Static (PLS)	AR(1)
		DM	0.976	0.471	0.976	0.998	0.854	0.471	0.382	0.471	0.703	0.397	0.555	0.844	0.382	0.555	0.303	0.303	0.342	0.397	
NL	T+15	MAE	0.455	0.595	0.508	0.587	0.758	0.526	0.690	0.595	0.746	0.691	0.690	0.751	0.753	0.690	1.037	1.037	0.965	0.691	0.791
		DM	0.193	0.568	0.154	0.302	0.788	0.493	0.405	0.568	0.873	0.411	0.518	0.744	0.765	0.518	0.499	0.499	0.654	0.411	
		MAE	0.829	0.592	0.847	0.702	0.733	0.569	0.690	0.592	0.695	0.691	0.689	0.731	0.711	0.689	1.035	1.035	0.994	0.691	0.779
	ALL	DM	0.805	0.272	0.731	0.308	0.477	0.235	0.203	0.272	0.548	0.209	0.334	0.462	0.337	0.334	0.120	0.120	0.225	0.209	

Table 7

Best model average

Evaluation period: 2024Q1 - 2024Q3

		Dynami c- Cou, CONC- Top10	Dynami c- Cou, CONC- Top25	Dynami c- Cou, CONC- Top5	Dynami c- Cou, CONC- Top50	Dynami c- EA, CONC- Top10	Dynami c- EA, CONC- Top25	Dynami c- EA, CONC- Top5	Dynami c- EA, CONC- Top50	Dynami c- EA, MAE- Top10	Dynami c- EA, MAE- Top25	Dynami c- EA, MAE- Top5	Dynami c- EA, MAE- Top50	Static (ALL)	Static (DFA)	Static (EN)	Static (LASSO)	Static (PCA)	Static (PLS)	AR(1)
EA	T-30 T T+15 ALL							*			*									
BE	T-30 T T+15 ALL				*	*	*	*												
DE	T-30 T T+15 ALL									*	*	*			*					
ES	T-30 T T+15 ALL				*	*	*	*												
FR	T-30 T T+15 ALL					*	*	*			*									
IT	T-30 T T+15 ALL					*		*				*	*		*					
NL	T-30 T T+15 ALL	*	*	*			*	*	*											

Table 8

Detailed nowcasts and actual values for each of the best model averages (described in Table 7)

Evaluation period: 2021Q4 - 2024Q3

	EA					BE					DE				
	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL
2024Q1	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.2	0.3	0.2	0.2	0.3	0.3	0.2	0.4
2024Q2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0	0.3	0.3	0.2	0.3
2024Q3	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0	-0.1	0	0.2	0.3	0.3	0.1	0.2

	ES					FR					IT				
	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL	Actual	T-30	T	T+15	ALL
2024Q1	0.7	1	1.1	1.1	1.1	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.2	0.4	0.3
2024Q2	0.8	1.1	0.8	0.8	0.9	0.3	0.5	0.3	0.3	0.4	0.2	0.3	0.1	0.3	0.3
2024Q3	0.8	0.8	0.6	0.6	0.7	0.4	0.3	0.3	0.3	0.3	0	0.3	0	0.3	0.3

	NL				
	Actual	T-30	T	T+15	ALL
2024Q1	-0.3	0.4	0.4	-0.6	0.4
2024Q2	1	0.4	0.4	0.1	0.4
2024Q3	0.8	0.4	0.3	0.6	0.4

8

Appendix A1: Individual models per country

Table 9

MAE and DM p-value, euro area

Evaluation period: 2021Q4 - 2024Q3

EA (±80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model2	0.339	0.436	0.311	0.256	0.235	0.929	0.295	0.196
Model9	0.339	0.436	0.311	0.256	0.235	0.929	0.295	0.196
Model10	0.520	0.046	0.408	0.038	0.724	0.008	0.550	0.000
Model11	0.157	0.213	0.146	0.067	0.144	0.058	0.149	0.007
Model13	0.160	0.231	0.156	0.112	0.149	0.064	0.155	0.011
Model15	0.602	0.060	0.524	0.022	0.362	0.129	0.496	0.001
Model16	0.609	0.078	0.458	0.017	0.887	0.004	0.651	0.000
Model23	0.609	0.078	0.458	0.017	0.887	0.004	0.651	0.000
Model36	0.398	0.297	0.522	0.089	1.062	0.014	0.660	0.002
Model41	0.644	0.096	0.345	0.140	0.476	0.011	0.488	0.003
Model47	0.504	0.048	0.310	0.219	0.223	0.894	0.346	0.036
Model49	0.360	0.433	0.454	0.104	0.462	0.076	0.425	0.012
Model51	0.244	0.895	0.313	0.275	0.390	0.228	0.315	0.224
Model53	0.332	0.557	0.237	0.881	0.261	0.625	0.277	0.439
Model56	0.539	0.005	0.535	0.024	0.403	0.099	0.492	0.000
Model57	0.277	0.875	0.147	0.095	0.144	0.078	0.189	0.228

EA (±80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model58	0.376	0.379	0.306	0.413	0.376	0.143	0.352	0.064
Model59	0.338	0.462	0.198	0.507	0.193	0.373	0.243	0.937
Model60	0.243	0.861	0.622	0.080	0.661	0.052	0.509	0.013
Model61	0.178	0.326	0.326	0.472	0.324	0.388	0.276	0.557
Model62	0.354	0.242	0.291	0.357	0.370	0.134	0.338	0.028
Model63	0.147	0.193	0.148	0.101	0.145	0.079	0.147	0.009
Model64	0.164	0.216	0.140	0.076	0.146	0.085	0.150	0.007
Model65	0.334	0.528	0.225	0.958	0.242	0.842	0.267	0.546
Model66	0.244	0.885	0.446	0.248	0.572	0.108	0.421	0.065
Model67	0.270	0.917	0.270	0.615	0.381	0.168	0.307	0.219
Model68	0.480	0.015	0.481	0.024	0.370	0.107	0.444	0.000
Model69	0.247	0.894	0.150	0.106	0.144	0.078	0.180	0.114
Model70	0.327	0.550	0.270	0.561	0.319	0.215	0.305	0.174
AR(1)	0.259		0.228		0.231		0.240	

Table 10**MAE and DM p-value, Belgium***Evaluation period: 2021Q4 - 2024Q3*

BE (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.232	0.253	0.251	0.144	0.367	0.886	0.284	0.309
Model2	0.232	0.253	0.251	0.144	0.367	0.886	0.284	0.309
Model9	0.232	0.253	0.251	0.144	0.367	0.886	0.284	0.309
Model10	0.361	0.943	0.310	0.682	0.470	0.319	0.380	0.524
Model11	0.127	0.015	0.203	0.068	0.202	0.041	0.177	0.000
Model12	0.121	0.011	0.152	0.000	0.150	0.000	0.141	0.000
Model13	0.129	0.015	0.201	0.064	0.201	0.039	0.177	0.000
Model14	0.118	0.010	0.166	0.000	0.162	0.000	0.149	0.000
Model15	0.255	0.307	0.320	0.910	0.310	0.600	0.295	0.376
Model16	0.190	0.067	0.207	0.002	0.272	0.100	0.223	0.000
Model23	0.190	0.067	0.207	0.002	0.272	0.100	0.223	0.000
Model24	0.396	0.764	0.440	0.348	0.626	0.163	0.487	0.101
Model29	0.476	0.408	0.311	0.736	0.395	0.587	0.394	0.411
Model30	0.524	0.294	0.397	0.630	0.568	0.177	0.497	0.074
Model35	0.167	0.056	0.309	0.783	0.414	0.414	0.297	0.356
Model36	0.756	0.113	0.291	0.591	0.415	0.593	0.487	0.143
Model37	0.521	0.273	0.619	0.009	0.637	0.028	0.592	0.001
Model39	0.571	0.189	0.720	0.007	0.641	0.025	0.644	0.000
Model41	0.173	0.065	0.263	0.316	0.137	0.000	0.191	0.000
Model42	0.557	0.154	0.504	0.343	0.576	0.119	0.545	0.021
Model43	0.307	0.745	0.769	0.031	0.759	0.032	0.612	0.010
Model45	0.257	0.494	0.628	0.059	0.550	0.094	0.478	0.095
Model46	1.275	0.055	1.087	0.082	1.115	0.065	1.159	0.001
Model47	0.174	0.064	0.230	0.132	0.193	0.001	0.199	0.000
Model48	0.613	0.074	0.724	0.011	0.831	0.048	0.723	0.000
Model49	0.310	0.639	0.480	0.238	0.596	0.105	0.462	0.099
Model50	0.616	0.038	0.670	0.072	0.933	0.048	0.740	0.001
Model51	0.256	0.299	0.349	0.875	0.439	0.431	0.348	0.954

BE (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model52	0.469	0.322	0.584	0.190	1.259	0.046	0.771	0.011
Model53	0.297	0.648	0.217	0.108	0.209	0.024	0.241	0.037
Model54	0.145	0.021	0.144	0.000	0.144	0.000	0.144	0.000
Model55	0.199	0.157	0.119	0.000	0.138	0.000	0.152	0.000
Model56	0.251	0.314	0.127	0.000	0.132	0.000	0.170	0.000
Model57	0.145	0.021	0.144	0.000	0.145	0.000	0.145	0.000
Model58	0.177	0.069	0.136	0.000	0.146	0.000	0.153	0.000
Model59	0.223	0.281	0.311	0.725	0.244	0.065	0.259	0.075
Model60	0.152	0.028	0.137	0.000	0.140	0.000	0.143	0.000
Model61	0.224	0.285	0.128	0.000	0.135	0.000	0.162	0.000
Model62	0.261	0.391	0.228	0.025	0.241	0.028	0.243	0.013
Model63	0.129	0.015	0.141	0.000	0.132	0.000	0.134	0.000
Model64	0.166	0.043	0.149	0.000	0.145	0.000	0.153	0.000
Model65	0.300	0.661	0.258	0.350	0.242	0.112	0.267	0.129
Model66	0.145	0.021	0.144	0.000	0.143	0.000	0.144	0.000
Model67	0.201	0.160	0.122	0.000	0.140	0.000	0.155	0.000
Model68	0.281	0.494	0.133	0.000	0.135	0.000	0.183	0.000
Model69	0.145	0.021	0.145	0.000	0.145	0.000	0.145	0.000
Model70	0.191	0.096	0.136	0.000	0.145	0.000	0.157	0.000
AR(1)	0.353		0.335		0.346		0.345	

Table 11**MAE and DM p-value, Germany***Evaluation period: 2021Q4 - 2024Q3.*

DE (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model19	0.750	0.040	0.437	0.482	0.395	0.868	0.527	0.050
Model20	0.761	0.028	0.446	0.610	0.458	0.667	0.555	0.032
Model21	0.812	0.051	0.437	0.482	0.366	0.621	0.538	0.072
Model22	0.787	0.033	0.446	0.610	0.429	0.864	0.554	0.044
Model25	0.584	0.109	0.496	0.374	0.488	0.477	0.523	0.044
Model31	1.118	0.013	0.998	0.078	1.037	0.009	1.051	0.000
Model33	0.954	0.038	1.140	0.072	0.960	0.003	1.018	0.000
Model38	0.902	0.026	0.735	0.104	0.610	0.235	0.749	0.002
Model40	0.830	0.041	0.768	0.084	0.798	0.064	0.798	0.001
Model43	0.529	0.081	0.911	0.048	0.710	0.074	0.716	0.001
Model45	0.523	0.085	0.412	0.811	0.589	0.193	0.508	0.040
Model50	0.862	0.025	0.837	0.165	1.007	0.108	0.902	0.002
Model52	0.734	0.057	0.703	0.051	0.457	0.661	0.631	0.007
Model56	0.492	0.171	0.413	0.674	0.455	0.500	0.453	0.104
Model57	0.312	0.962	0.361	0.379	0.366	0.159	0.346	0.566
Model58	0.359	0.633	0.364	0.496	0.360	0.159	0.361	0.863
Model68	0.481	0.185	0.418	0.622	0.477	0.373	0.459	0.085
Model69	0.361	0.635	0.360	0.367	0.366	0.165	0.362	0.887
Model70	0.396	0.480	0.356	0.392	0.355	0.153	0.369	0.982
AR(1)	0.306		0.388		0.409		0.368	

Table 12**MAE and DM p-value, Spain***Evaluation period: 2021Q4 - 2024Q3.*

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.770	0.145	0.641	0.264	1.517	0.033	0.976	0.006
Model2	0.637	0.257	0.561	0.404	0.488	0.529	0.562	0.113
Model3	0.825	0.269	0.611	0.415	0.599	0.307	0.679	0.080
Model4	0.825	0.269	0.611	0.415	0.599	0.307	0.679	0.080
Model5	0.864	0.238	0.542	0.592	0.494	0.631	0.633	0.153
Model6	0.864	0.238	0.542	0.592	0.494	0.631	0.633	0.153
Model7	0.864	0.238	0.542	0.592	0.494	0.631	0.633	0.153
Model8	0.864	0.238	0.542	0.592	0.494	0.631	0.633	0.153
Model9	0.637	0.257	0.561	0.404	0.488	0.529	0.562	0.113
Model10	0.722	0.131	0.593	0.318	0.805	0.099	0.707	0.012
Model11	0.579	0.511	0.558	0.296	0.549	0.303	0.562	0.106
Model12	0.617	0.273	0.464	0.984	0.468	0.664	0.516	0.342
Model13	0.579	0.510	0.562	0.295	0.554	0.303	0.565	0.104
Model14	0.613	0.222	0.504	0.690	0.563	0.311	0.560	0.118
Model15	0.900	0.105	0.871	0.122	0.896	0.049	0.889	0.002
Model16	0.639	0.230	0.871	0.122	0.896	0.049	0.802	0.005
Model23	0.681	0.141	0.634	0.272	0.982	0.065	0.766	0.010
Model24	0.700	0.135	0.981	0.066	1.240	0.023	0.974	0.001
Model25	0.843	0.260	0.434	0.909	0.460	0.889	0.579	0.434
Model26	0.956	0.192	0.716	0.380	0.737	0.268	0.803	0.046
Model27	0.815	0.281	0.440	0.922	0.414	0.952	0.557	0.495
Model36	1.763	0.014	1.265	0.048	1.501	0.025	1.510	0.000
Model41	0.789	0.134	0.752	0.048	0.534	0.300	0.692	0.007
Model47	1.064	0.083	0.515	0.507	0.431	0.960	0.670	0.069
Model49	0.444	0.664	1.148	0.005	1.473	0.001	1.022	0.000
Model51	0.433	0.575	1.185	0.008	1.549	0.000	1.056	0.000
Model53	0.458	0.711	0.498	0.763	0.410	0.829	0.455	0.889
Model54	0.502	0.993	0.468	0.954	0.471	0.579	0.481	0.769

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model55	0.505	0.981	0.533	0.552	0.395	0.660	0.477	0.825
Model56	0.692	0.285	0.494	0.766	0.443	0.839	0.543	0.267
Model57	0.494	0.952	0.495	0.769	0.497	0.408	0.495	0.595
Model58	0.543	0.777	0.481	0.864	0.471	0.597	0.498	0.587
Model59	0.461	0.760	0.505	0.694	0.413	0.862	0.460	0.954
Model60	0.502	0.993	0.495	0.769	0.497	0.411	0.498	0.559
Model61	0.493	0.944	0.486	0.831	0.486	0.472	0.488	0.673
Model62	0.593	0.472	0.440	0.830	0.424	0.975	0.486	0.703
Model63	0.501	0.999	0.496	0.768	0.497	0.411	0.498	0.563
Model64	0.500	0.994	0.492	0.788	0.492	0.445	0.495	0.598
Model65	0.464	0.745	0.492	0.798	0.405	0.786	0.454	0.867
Model66	0.500	0.993	0.476	0.897	0.471	0.577	0.483	0.744
Model67	0.496	0.970	0.514	0.658	0.396	0.684	0.469	0.931
Model68	0.640	0.376	0.492	0.778	0.438	0.894	0.523	0.365
Model69	0.498	0.979	0.496	0.767	0.497	0.408	0.497	0.574
Model70	0.523	0.891	0.481	0.862	0.474	0.575	0.493	0.663
AR(1)	0.501		0.462		0.427		0.463	

Table 13**MAE and DM p-value, France***Evaluation period: 2021Q4 - 2024Q3.*

FR (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model2	0.277	0.721	0.291	0.353	0.210	0.592	0.259	0.963
Model9	0.277	0.721	0.291	0.353	0.210	0.592	0.259	0.963
Model10	0.401	0.588	0.328	0.218	0.533	0.040	0.421	0.024
Model11	0.231	0.403	0.196	0.240	0.202	0.330	0.210	0.201
Model13	0.233	0.406	0.208	0.589	0.213	0.745	0.218	0.302
Model15	0.406	0.595	0.356	0.207	0.459	0.010	0.407	0.025
Model16	0.322	0.991	0.331	0.137	0.483	0.008	0.379	0.047
Model23	0.324	1.000	0.264	0.520	0.323	0.152	0.304	0.365
Model24	0.377	0.687	0.505	0.073	0.410	0.051	0.430	0.018
Model29	0.858	0.045	0.425	0.173	0.493	0.060	0.592	0.002
Model41	0.756	0.084	0.543	0.034	0.587	0.014	0.628	0.000
Model49	0.169	0.229	0.528	0.024	0.675	0.004	0.457	0.018
Model54	0.422	0.403	0.184	0.370	0.203	0.542	0.269	0.769
Model55	0.432	0.343	0.206	0.613	0.185	0.145	0.274	0.666
Model57	0.532	0.050	0.178	0.407	0.169	0.291	0.293	0.415
Model59	0.231	0.476	0.196	0.594	0.187	0.180	0.205	0.251
Model60	0.167	0.067	0.172	0.235	0.171	0.167	0.170	0.009
Model61	0.154	0.098	0.192	0.344	0.181	0.124	0.176	0.025
Model62	0.412	0.611	0.426	0.240	0.410	0.221	0.416	0.084
Model63	0.197	0.226	0.182	0.213	0.183	0.119	0.187	0.055
Model64	0.203	0.265	0.180	0.204	0.183	0.119	0.189	0.068
Model66	0.395	0.446	0.200	0.565	0.185	0.281	0.260	0.929
Model67	0.391	0.448	0.207	0.624	0.189	0.189	0.263	0.862
Model69	0.526	0.125	0.173	0.318	0.169	0.253	0.289	0.516
AR(1)	0.324		0.223		0.224		0.257	

Table 14**MAE and DM p-value, Italy***Evaluation period: 2021Q4 - 2024Q3*

IT (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.371	0.447	0.370	0.889	0.803	0.354	0.515	0.437
Model15	0.417	0.703	0.531	0.311	1.155	0.103	0.701	0.073
Model16	0.432	0.829	0.386	0.593	0.322	0.823	0.380	0.933
Model23	0.402	0.604	0.386	0.593	0.322	0.823	0.370	0.770
Model29	0.577	0.536	0.311	0.585	0.546	0.124	0.478	0.248
Model38	0.978	0.144	0.460	0.543	0.288	0.478	0.575	0.150
Model40	1.014	0.130	0.517	0.435	0.296	0.610	0.609	0.112
Model41	0.350	0.209	0.256	0.216	0.491	0.399	0.365	0.784
Model56	0.322	0.171	0.292	0.158	0.318	0.546	0.310	0.046
Model68	0.329	0.206	0.288	0.159	0.318	0.548	0.312	0.056
AR(1)	0.454		0.355		0.343		0.384	

Table 15**MAE and DM p-value, Netherlands***Evaluation period: 2021Q4 - 2024Q3*

NL (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model7	0.720	0.541	0.684	0.514	0.675	0.438	0.693	0.227
Model8	0.665	0.379	0.650	0.407	0.641	0.349	0.652	0.113
Model19	0.718	0.489	0.630	0.386	0.581	0.251	0.643	0.101
Model21	0.718	0.489	0.630	0.386	0.581	0.251	0.643	0.101
Model26	0.668	0.308	0.616	0.343	0.551	0.173	0.612	0.044
Model28	0.678	0.327	0.628	0.344	0.581	0.175	0.629	0.049
Model37	0.743	0.556	0.840	0.672	0.699	0.582	0.761	0.670
Model38	0.711	0.494	0.867	0.546	0.783	0.992	0.787	0.920
Model51	0.721	0.543	0.839	0.614	0.704	0.446	0.755	0.594
Model52	0.745	0.662	0.652	0.359	0.632	0.282	0.676	0.175
AR(1)	0.831		0.776		0.781		0.796	

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Appendix A3: model averages per country

Table 16

MAE and DM p-value, euro area

Evaluation period: 2024Q1 - 2024Q3

EA (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.152	0.714	0.180	0.977	0.107	0.464	0.146	0.712
Static (PCA)	0.095	0.552	0.071	0.575	0.070	0.368	0.078	0.190
Static (PLS)	0.095	0.552	0.071	0.575	0.070	0.368	0.078	0.190
Static (LASSO)	0.123	0.770	0.095	0.609	0.046	0.211	0.088	0.187
Static (RIDGE)	0.150	0.166	0.077	0.583	0.075	0.329	0.101	0.289
Static (EN)	0.117	0.923	0.066	0.370	0.060	0.187	0.081	0.099
Static (ALL)	0.262	0.278	0.099	0.692	0.109	0.134	0.157	0.778
Dynamic-EA, MAE-Top5	0.152	0.714	0.180	0.977	0.107	0.464	0.146	0.712
Dynamic-EA, MAE-Top10	0.386	0.187	0.238	0.883	0.371	0.492	0.332	0.207
Dynamic-EA, MAE-Top25	0.042	0.160	0.043	0.465	0.039	0.289	0.041	0.068
Dynamic-EA, MAE-Top50	0.179	0.505	0.233	0.772	0.246	0.977	0.219	0.541
Dynamic-EA, CONC-Top5	0.042	0.161	0.043	0.465	0.038	0.286	0.041	0.067
Dynamic-EA, CONC-Top10	0.184	0.487	0.247	0.737	0.285	0.825	0.239	0.434
Dynamic-EA, CONC-Top25	0.363	0.130	0.228	0.873	0.395	0.533	0.329	0.164
Dynamic-EA, CONC-Top50	0.363	0.130	0.228	0.873	0.330	0.638	0.307	0.197
Dynamic-Cou, MAE-Top5	0.163	0.050	0.084	0.575	0.109	0.465	0.119	0.402

EA (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Dynamic-Cou, MAE-Top10	0.133	0.661	0.128	0.710	0.096	0.284	0.119	0.318
Dynamic-Cou, MAE-Top25	0.180	0.032	0.091	0.588	0.115	0.479	0.129	0.476
Dynamic-Cou, MAE-Top50	0.180	0.032	0.091	0.588	0.115	0.479	0.129	0.476
Dynamic-Cou, CONC-Top5	0.159	0.538	0.237	0.740	0.249	0.957	0.215	0.536
Dynamic-Cou, CONC-Top10	0.159	0.538	0.237	0.740	0.220	0.876	0.205	0.659
Dynamic-Cou, CONC-Top25	0.363	0.130	0.228	0.873	0.330	0.638	0.307	0.197
AR(1)	0.109		0.187		0.241		0.179	

Table 17**MAE and DM p-value, Belgium***Evaluation period: 2024Q1 - 2024Q3.*

BE (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.173	0.202	0.148	0.267	0.150	0.557	0.157	0.033
Static (PCA)	0.986	0.343	0.600	0.954	0.308	0.942	0.631	0.528
Static (PLS)	1.001	0.356	1.065	0.029	0.962	0.155	1.009	0.006
Static (LASSO)	0.923	0.545	0.518	0.711	0.247	0.865	0.563	0.944
Static (RIDGE)	0.915	0.541	0.775	0.682	0.914	0.183	0.868	0.095
Static (EN)	0.923	0.545	0.518	0.711	0.247	0.865	0.563	0.944
Static (ALL)	0.915	0.541	0.775	0.682	0.914	0.183	0.868	0.095
Dynamic-EA, MAE-Top5	0.173	0.202	0.148	0.267	0.150	0.557	0.157	0.033
Dynamic-EA, MAE-Top10	0.298	0.256	0.282	0.340	0.225	0.857	0.268	0.105
Dynamic-EA, MAE-Top25	0.176	0.204	0.162	0.299	0.157	0.570	0.165	0.038
Dynamic-EA, MAE-Top50	0.178	0.203	0.171	0.298	0.162	0.570	0.170	0.038
Dynamic-EA, CONC-Top5	0.173	0.202	0.162	0.299	0.157	0.568	0.164	0.038
Dynamic-EA, CONC-Top10	0.181	0.206	0.171	0.299	0.160	0.572	0.171	0.039
Dynamic-EA, CONC-Top25	0.288	0.273	0.269	0.390	0.298	0.963	0.285	0.125
Dynamic-EA, CONC-Top50	0.288	0.273	0.269	0.390	0.298	0.963	0.285	0.125
Dynamic-Cou, MAE-Top5	0.493	0.670	0.679	0.881	0.915	0.084	0.696	0.569
Dynamic-Cou, MAE-Top10	0.604	0.821	0.918	0.562	1.228	0.054	0.917	0.227
Dynamic-Cou, MAE-Top25	0.500	0.664	0.686	0.854	0.900	0.105	0.695	0.554
Dynamic-Cou, MAE-Top50	0.607	0.824	0.953	0.489	1.208	0.064	0.923	0.211
Dynamic-Cou, CONC-Top5	0.500	0.664	0.686	0.854	0.900	0.105	0.695	0.554
Dynamic-Cou, CONC-Top10	0.607	0.824	0.953	0.489	1.208	0.064	0.923	0.211
Dynamic-Cou, CONC-Top25	0.288	0.273	0.269	0.390	0.298	0.963	0.285	0.125
Dynamic-Cou, CONC-Top50	0.064	0.112	0.113	0.223	0.127	0.321	0.101	0.012
AR(1)	0.760		0.615		0.288		0.554	

Table 18

MAE and DM p-value, Germany

Evaluation period: 2024Q1 - 2024Q3

DE (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.166	0.381	0.190	0.156	0.185	0.207	0.180	0.012
Static (ALL)	0.255	0.659	0.275	0.212	0.163	0.146	0.231	0.026
Dynamic-EA, MAE-Top5	0.166	0.381	0.190	0.156	0.185	0.207	0.180	0.012
Dynamic-EA, MAE-Top10	0.205	0.354	0.208	0.139	0.110	0.158	0.174	0.010
Dynamic-EA, MAE-Top25	0.175	0.407	0.173	0.165	0.177	0.178	0.175	0.012
Dynamic-EA, MAE-Top50	0.276	0.673	0.215	0.205	0.265	0.257	0.252	0.039
Dynamic-EA, CONC-Top5	0.175	0.408	0.173	0.165	0.178	0.179	0.175	0.012
Dynamic-EA, CONC-Top25	0.386	0.961	0.296	0.264	0.648	0.909	0.443	0.407
Dynamic-EA, CONC-Top50	0.386	0.961	0.296	0.264	0.364	0.304	0.349	0.101
Dynamic-Cou, CONC-Top25	0.386	0.961	0.296	0.264	0.364	0.304	0.349	0.101
AR(1)	0.376		0.743		0.714		0.611	

Table 19

MAE and DM p-value, Spain

Evaluation period: 2024Q1 - 2024Q3

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.441	0.237	0.628	0.498	0.421	0.177	0.497	0.024
Dynamic-EA, MAE-Top5	0.441	0.237	0.628	0.498	0.421	0.177	0.497	0.024
Dynamic-EA, MAE-Top10	0.325	0.178	0.590	0.256	0.321	0.047	0.412	0.003
Dynamic-EA, CONC-Top25	0.473	0.442	0.378	0.038	0.447	0.055	0.433	0.014
Dynamic-EA, CONC-Top50	0.473	0.442	0.378	0.038	0.447	0.055	0.433	0.014
Dynamic-Cou, CONC-Top25	0.473	0.442	0.378	0.038	0.447	0.055	0.433	0.014
Dynamic-Cou, CONC-Top50	0.211	0.289	0.226	0.009	0.201	0.010	0.212	0.002
AR(1)	1.057		0.963		1.001		1.007	

Table 20**MAE and DM p-value, France***Evaluation period: 2024Q1 - 2024Q3*

FR (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.113	0.215	0.116	0.071	0.190	0.317	0.140	0.009
Static (PCA)	0.326	0.892	0.194	0.121	0.241	0.487	0.254	0.095
Static (PLS)	0.326	0.892	0.194	0.121	0.241	0.487	0.254	0.095
Static (LASSO)	0.339	0.933	0.180	0.124	0.244	0.492	0.254	0.101
Static (RIDGE)	0.339	0.933	0.180	0.124	0.244	0.492	0.254	0.101
Static (EN)	0.339	0.933	0.180	0.124	0.244	0.492	0.254	0.101
Static (ALL)	0.339	0.933	0.180	0.124	0.244	0.492	0.254	0.101
Dynamic-EA, MAE-Top5	0.113	0.215	0.116	0.071	0.190	0.317	0.140	0.009
Dynamic-EA, MAE-Top10	0.213	0.196	0.339	0.181	0.347	0.551	0.300	0.064
Dynamic-EA, MAE-Top25	0.138	0.368	0.066	0.037	0.063	0.210	0.089	0.006
Dynamic-EA, MAE-Top50	0.112	0.370	0.101	0.019	0.088	0.174	0.100	0.003
Dynamic-EA, CONC-Top5	0.135	0.359	0.067	0.037	0.064	0.209	0.089	0.005
Dynamic-EA, CONC-Top10	0.101	0.334	0.084	0.019	0.054	0.184	0.080	0.003
Dynamic-EA, CONC-Top25	0.169	0.138	0.328	0.141	0.226	0.390	0.241	0.024
Dynamic-EA, CONC-Top50	0.169	0.138	0.328	0.141	0.226	0.390	0.241	0.024
Dynamic-Cou, MAE-Top5	0.209	0.591	0.310	0.016	0.507	0.810	0.342	0.124
Dynamic-Cou, CONC-Top25	0.169	0.138	0.328	0.141	0.267	0.399	0.255	0.023
Dynamic-Cou, CONC-Top50	0.119	0.211	0.248	0.064	0.155	0.381	0.174	0.017
AR(1)	0.362		0.809		0.614		0.595	

Table 21**MAE and DM p-value, Italy***Evaluation period: 2024Q1 - 2024Q3*

IT (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.173	0.014	0.134	0.265	0.151	0.396	0.152	0.008
Static (PCA)	0.175	0.027	0.347	0.911	0.475	0.665	0.332	0.774
Static (PLS)	0.294	0.269	0.675	0.413	0.513	0.681	0.494	0.515
Static (LASSO)	0.254	0.218	0.587	0.488	0.415	0.810	0.419	0.780
Static (RIDGE)	0.254	0.218	0.587	0.488	0.415	0.810	0.419	0.780
Dynamic-EA, MAE-Top5	0.173	0.014	0.134	0.265	0.151	0.396	0.152	0.008
Dynamic-EA, MAE-Top10	0.334	0.226	0.244	0.635	0.283	0.712	0.287	0.149
Dynamic-EA, MAE-Top25	0.118	0.005	0.181	0.476	0.158	0.416	0.152	0.018
Dynamic-EA, MAE-Top50	0.490	0.970	0.068	0.072	0.192	0.399	0.250	0.134
Dynamic-EA, CONC-Top5	0.118	0.006	0.183	0.489	0.163	0.438	0.155	0.020
Dynamic-EA, CONC-Top10	0.471	0.941	0.068	0.071	0.167	0.278	0.235	0.069
Dynamic-EA, CONC-Top25	0.213	0.004	0.205	0.525	0.187	0.420	0.201	0.024
Dynamic-EA, CONC-Top50	0.213	0.004	0.209	0.549	0.187	0.420	0.203	0.027
Dynamic-Cou, MAE-Top5	0.199	0.257	0.657	0.345	0.668	0.346	0.508	0.435
Dynamic-Cou, MAE-Top10	0.199	0.257	0.657	0.345	0.668	0.346	0.508	0.435
Dynamic-Cou, MAE-Top25	0.212	0.247	0.669	0.297	0.619	0.280	0.500	0.409
Dynamic-Cou, MAE-Top50	0.212	0.247	0.669	0.297	0.631	0.286	0.504	0.400
Dynamic-Cou, CONC-Top5	0.849	0.185	0.495	0.303	0.264	0.445	0.536	0.113
Dynamic-Cou, CONC-Top25	0.213	0.004	0.209	0.549	0.164	0.294	0.195	0.016
Dynamic-Cou, CONC-Top50	0.169	0.165	0.218	0.619	0.183	0.325	0.190	0.047
AR(1)	0.483		0.312		0.324		0.373	

Table 22

MAE and DM p-value, Netherlands
Evaluation period: 2024Q1 - 2024Q3

NL (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Dynamic-EA, MAE-Top50	0.6404	0.639	0.8008	0.844	0.7506	0.7436	0.7306	0.462
Dynamic-EA, CONC-Top10	0.6385	0.6208	0.8033	0.8543	0.7584	0.7878	0.7334	0.477
Dynamic-Cou, CONC-Top5	1.219	0.2588	0.8138	0.9756	0.5078	0.1539	0.8468	0.7306
Dynamic-Cou, CONC-Top10	1.219	0.2588	0.8138	0.9756	0.4549	0.193	0.8292	0.8053
AR(1)	0.7179		0.8276		0.7907		0.7787	

Appendix B1: individual models per country with outliers correction

Table 23

MAE and DM p-value, euro area

Evaluation period: 2021Q4 - 2024Q3

EA (>70 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.251	0.068	0.254	0.475	0.105	0.106	0.203	0.611
Model2	0.251	0.068	0.254	0.475	0.132	0.064	0.212	0.396
Model3	0.174	0.770	0.179	0.700	0.178	0.730	0.177	0.841
Model4	0.174	0.770	0.179	0.700	0.178	0.730	0.177	0.841
Model5	0.078	0.180	0.183	0.759	0.208	0.941	0.156	0.437
Model6	0.157	0.872	0.166	0.615	0.218	0.830	0.180	0.893
Model8	0.174	0.776	0.191	0.789	0.192	0.850	0.186	0.991
Model9	0.251	0.068	0.254	0.475	0.132	0.064	0.212	0.396
Model10	0.382	0.008	0.315	0.132	0.399	0.042	0.365	0.000
Model11	0.200	0.530	0.167	0.321	0.156	0.227	0.174	0.730
Model12	0.259	0.434	0.180	0.607	0.168	0.495	0.203	0.731
Model13	0.199	0.532	0.167	0.314	0.156	0.215	0.174	0.718
Model14	0.242	0.469	0.185	0.678	0.172	0.512	0.199	0.761
Model15	0.484	0.001	0.430	0.035	0.296	0.179	0.403	0.000
Model16	0.475	0.002	0.430	0.035	0.368	0.036	0.424	0.000
Model23	0.475	0.002	0.430	0.035	0.368	0.036	0.424	0.000

EA (>70 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model25	0.194	0.530	0.162	0.489	0.152	0.437	0.169	0.661
Model27	0.192	0.568	0.173	0.622	0.176	0.579	0.180	0.885
Model29	0.422	0.014	0.246	0.725	0.152	0.480	0.273	0.134
Model30	0.292	0.150	0.197	0.899	0.234	0.700	0.241	0.238
Model31	0.252	0.315	0.183	0.758	0.201	0.990	0.212	0.566
Model33	0.253	0.315	0.183	0.767	0.176	0.727	0.204	0.689
Model37	0.095	0.486	0.157	0.186	0.162	0.279	0.138	0.094
Model39	0.166	0.810	0.159	0.238	0.160	0.317	0.162	0.435
Model41	0.380	0.051	0.192	0.829	0.191	0.753	0.254	0.147
Model45	0.235	0.506	0.200	0.951	0.171	0.575	0.202	0.762
Model47	0.260	0.116	0.250	0.553	0.247	0.325	0.252	0.056
Model49	0.203	0.298	0.245	0.639	0.268	0.422	0.239	0.176
Model51	0.220	0.281	0.235	0.555	0.223	0.638	0.226	0.162
Model53	0.330	0.189	0.196	0.813	0.192	0.789	0.239	0.269
Model54	0.399	0.122	0.381	0.252	0.384	0.161	0.388	0.011
Model55	0.424	0.138	0.363	0.204	0.462	0.139	0.416	0.009
Model56	0.677	0.004	0.617	0.022	0.410	0.174	0.568	0.000
Model57	0.372	0.070	0.184	0.495	0.162	0.115	0.239	0.233
Model58	0.614	0.042	0.394	0.100	0.368	0.218	0.459	0.003
Model59	0.295	0.186	0.220	0.750	0.198	0.640	0.238	0.175
Model60	0.383	0.050	0.558	0.075	0.556	0.089	0.499	0.001
Model61	0.323	0.032	0.484	0.206	0.452	0.152	0.419	0.009
Model62	0.423	0.053	0.369	0.175	0.401	0.211	0.398	0.005
Model63	0.300	0.031	0.184	0.499	0.161	0.109	0.215	0.312
Model64	0.404	0.045	0.184	0.520	0.161	0.125	0.250	0.177
Model65	0.325	0.180	0.193	0.752	0.190	0.693	0.236	0.274
Model66	0.376	0.071	0.415	0.238	0.404	0.231	0.398	0.012
Model67	0.408	0.088	0.386	0.248	0.474	0.131	0.422	0.006
Model68	0.671	0.003	0.587	0.024	0.356	0.252	0.538	0.000
Model69	0.365	0.052	0.183	0.476	0.162	0.115	0.237	0.219
Model70	0.616	0.032	0.350	0.133	0.310	0.294	0.425	0.005

EA (>70 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
AR(1)	0.147		0.206		0.202		0.185	

Table 24**MAE and DM p-value, Belgium***Evaluation period: 2021Q4 - 2024Q3*

BE (> 80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.157	0.067	0.165	0.004	0.129	0.000	0.150	0.000
Model2	0.157	0.067	0.165	0.004	0.129	0.000	0.150	0.000
Model3	0.246	0.810	0.195	0.033	0.159	0.007	0.200	0.002
Model4	0.211	0.425	0.228	0.075	0.215	0.024	0.218	0.003
Model5	0.275	0.796	0.179	0.022	0.148	0.003	0.201	0.005
Model6	0.203	0.326	0.210	0.097	0.218	0.038	0.210	0.004
Model7	0.275	0.796	0.179	0.022	0.148	0.003	0.201	0.005
Model8	0.203	0.326	0.210	0.097	0.218	0.038	0.210	0.004
Model9	0.157	0.067	0.165	0.004	0.129	0.000	0.150	0.000
Model10	0.253	0.919	0.226	0.058	0.238	0.144	0.239	0.030
Model11	0.178	0.080	0.182	0.003	0.172	0.000	0.177	0.000
Model12	0.211	0.220	0.182	0.008	0.172	0.002	0.189	0.000
Model13	0.177	0.076	0.182	0.003	0.172	0.000	0.177	0.000
Model14	0.212	0.216	0.183	0.009	0.172	0.002	0.189	0.000
Model15	0.219	0.111	0.204	0.003	0.236	0.005	0.220	0.000
Model16	0.214	0.091	0.221	0.001	0.239	0.000	0.225	0.000
Model17	0.438	0.017	0.439	0.365	0.435	0.415	0.437	0.026
Model18	0.367	0.080	0.312	0.793	0.309	0.576	0.329	0.521
Model19	0.327	0.150	0.318	0.870	0.326	0.782	0.324	0.592
Model20	0.281	0.358	0.273	0.311	0.283	0.234	0.279	0.224
Model21	0.327	0.150	0.318	0.870	0.326	0.782	0.324	0.592
Model22	0.281	0.358	0.273	0.311	0.283	0.234	0.279	0.224

BE (> 80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model23	0.214	0.091	0.221	0.001	0.239	0.000	0.225	0.000
Model24	0.221	0.752	0.234	0.350	0.213	0.169	0.222	0.123
Model25	0.124	0.066	0.148	0.009	0.120	0.002	0.130	0.000
Model26	0.208	0.482	0.236	0.239	0.257	0.304	0.234	0.067
Model27	0.133	0.109	0.139	0.010	0.121	0.007	0.131	0.000
Model28	0.191	0.284	0.217	0.158	0.237	0.217	0.215	0.020
Model29	0.118	0.021	0.106	0.000	0.131	0.001	0.118	0.000
Model30	0.083	0.011	0.119	0.000	0.114	0.000	0.105	0.000
Model31	0.243	0.881	0.202	0.045	0.197	0.025	0.214	0.024
Model32	0.265	0.945	0.214	0.131	0.200	0.081	0.227	0.098
Model33	0.246	0.904	0.202	0.048	0.198	0.023	0.215	0.027
Model34	0.255	0.983	0.159	0.036	0.202	0.111	0.206	0.048
Model35	0.051	0.010	0.109	0.007	0.174	0.066	0.111	0.000
Model36	0.077	0.029	0.228	0.131	0.227	0.164	0.178	0.002
Model37	0.159	0.155	0.132	0.011	0.089	0.001	0.127	0.000
Model38	0.188	0.419	0.325	0.980	0.368	0.785	0.294	0.788
Model39	0.133	0.110	0.086	0.002	0.097	0.003	0.105	0.000
Model40	0.205	0.502	0.259	0.392	0.296	0.654	0.254	0.227
Model41	0.143	0.027	0.115	0.000	0.112	0.001	0.123	0.000
Model42	0.089	0.027	0.083	0.001	0.114	0.002	0.095	0.000
Model43	0.132	0.010	0.151	0.000	0.143	0.000	0.142	0.000
Model44	0.272	0.895	0.213	0.071	0.218	0.046	0.234	0.089
Model45	0.118	0.011	0.131	0.001	0.113	0.000	0.121	0.000
Model46	0.272	0.883	0.161	0.014	0.155	0.020	0.196	0.016
Model47	0.127	0.040	0.170	0.009	0.174	0.004	0.157	0.000
Model48	0.086	0.055	0.068	0.002	0.119	0.002	0.091	0.000
Model49	0.102	0.012	0.155	0.030	0.127	0.009	0.128	0.000
Model50	0.165	0.437	0.319	0.916	0.292	0.582	0.259	0.338
Model51	0.094	0.010	0.153	0.009	0.152	0.014	0.133	0.000
Model52	0.147	0.227	0.201	0.096	0.266	0.260	0.204	0.014
Model53	0.288	0.809	0.199	0.151	0.184	0.076	0.224	0.131

BE (> 80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model54	0.253	0.939	0.179	0.006	0.156	0.000	0.196	0.001
Model55	0.358	0.374	0.189	0.027	0.162	0.002	0.236	0.140
Model56	0.258	0.999	0.205	0.047	0.156	0.003	0.206	0.011
Model57	0.252	0.937	0.175	0.005	0.153	0.000	0.194	0.001
Model58	0.238	0.820	0.184	0.011	0.157	0.000	0.193	0.003

Table 25**MAE and DM p-value, Germany***Evaluation period: 2021Q4 - 2024Q3*

DE (>40 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model3	0.365	0.582	0.309	0.455	0.315	0.381	0.330	0.611
Model4	0.365	0.582	0.309	0.455	0.315	0.381	0.330	0.611
Model5	0.363	0.587	0.314	0.468	0.318	0.362	0.332	0.621
Model6	0.363	0.587	0.314	0.468	0.318	0.362	0.332	0.621
Model8	0.319	0.915	0.355	0.714	0.384	0.933	0.353	0.955
Model12	0.325	0.833	0.313	0.430	0.307	0.194	0.315	0.330
Model14	0.294	0.904	0.293	0.329	0.290	0.159	0.292	0.151
Model15	0.663	0.017	0.472	0.427	0.458	0.700	0.531	0.039
Model17	0.321	0.887	0.237	0.027	0.290	0.205	0.283	0.118
Model18	0.327	0.827	0.281	0.097	0.333	0.465	0.314	0.330
Model19	0.317	0.915	0.270	0.066	0.315	0.324	0.301	0.209
Model20	0.319	0.894	0.269	0.062	0.312	0.310	0.300	0.205
Model21	0.317	0.915	0.270	0.066	0.315	0.324	0.301	0.209
Model22	0.319	0.894	0.269	0.062	0.312	0.310	0.300	0.205
Model26	0.315	0.874	0.338	0.688	0.331	0.511	0.328	0.518
Model28	0.315	0.874	0.327	0.626	0.333	0.551	0.325	0.501
Model31	0.469	0.228	0.332	0.612	0.341	0.620	0.381	0.663
Model32	0.394	0.348	0.336	0.714	0.377	0.925	0.369	0.807
Model33	0.396	0.506	0.483	0.171	0.351	0.607	0.410	0.316
Model43	0.407	0.329	0.283	0.127	0.255	0.016	0.315	0.359
Model44	0.492	0.162	0.425	0.479	0.445	0.456	0.454	0.065
Model46	0.257	0.691	0.399	0.757	0.428	0.646	0.362	0.908
Model50	0.275	0.438	0.315	0.646	0.277	0.323	0.289	0.214
Model56	0.392	0.685	0.299	0.410	0.470	0.540	0.387	0.701
Model57	0.248	0.537	0.371	0.970	0.352	0.000	0.324	0.317
Model60	0.315	0.925	0.322	0.546	0.305	0.233	0.314	0.363
Model68	0.405	0.638	0.302	0.411	0.477	0.504	0.395	0.631
Model69	0.286	0.885	0.379	0.896	0.351	0.000	0.339	0.706
AR(1)	0.305		0.372		0.388		0.355	

Table 26**MAE and DM p-value, Spain***Evaluation period: 2021Q4 - 2024Q3*

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.389	0.073	0.353	0.028	0.479	0.021	0.407	0.000
Model2	0.295	0.117	0.276	0.219	0.260	0.331	0.277	0.018
Model3	0.298	0.085	0.412	0.001	0.415	0.001	0.375	0.000
Model4	0.298	0.085	0.412	0.001	0.415	0.001	0.375	0.000
Model5	0.299	0.080	0.405	0.002	0.405	0.002	0.369	0.000
Model6	0.299	0.080	0.405	0.002	0.405	0.002	0.369	0.000
Model7	0.299	0.080	0.405	0.002	0.405	0.002	0.369	0.000
Model8	0.299	0.080	0.405	0.002	0.405	0.002	0.369	0.000
Model9	0.295	0.117	0.276	0.219	0.260	0.331	0.277	0.018
Model10	0.366	0.107	0.337	0.149	0.396	0.069	0.366	0.002
Model11	0.411	0.007	0.353	0.019	0.360	0.019	0.375	0.000
Model12	0.486	0.015	0.358	0.008	0.336	0.005	0.394	0.000
Model13	0.420	0.007	0.352	0.020	0.359	0.019	0.377	0.000
Model14	0.448	0.005	0.366	0.006	0.351	0.012	0.388	0.000
Model15	0.376	0.150	0.446	0.026	0.466	0.024	0.429	0.000
Model16	0.376	0.150	0.446	0.026	0.466	0.024	0.429	0.000
Model17	0.318	0.071	0.332	0.057	0.340	0.055	0.330	0.000
Model18	0.318	0.029	0.315	0.050	0.322	0.049	0.319	0.000
Model19	0.328	0.026	0.327	0.043	0.350	0.013	0.335	0.000
Model20	0.328	0.026	0.327	0.043	0.350	0.013	0.335	0.000
Model21	0.328	0.026	0.327	0.043	0.350	0.013	0.335	0.000
Model22	0.328	0.026	0.327	0.043	0.350	0.013	0.335	0.000
Model23	0.358	0.142	0.403	0.042	0.506	0.007	0.422	0.000
Model24	0.408	0.160	0.476	0.011	0.491	0.022	0.458	0.000
Model25	0.320	0.055	0.336	0.034	0.341	0.034	0.333	0.000
Model26	0.333	0.026	0.342	0.008	0.344	0.008	0.339	0.000
Model27	0.320	0.062	0.351	0.019	0.359	0.017	0.343	0.000
Model28	0.338	0.017	0.343	0.005	0.347	0.004	0.343	0.000

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model29	0.284	0.344	0.405	0.028	0.332	0.140	0.340	0.006
Model30	0.382	0.060	0.323	0.040	0.301	0.178	0.335	0.001
Model31	0.415	0.010	0.387	0.003	0.388	0.003	0.397	0.000
Model32	0.400	0.020	0.470	0.037	0.465	0.041	0.445	0.000
Model33	0.412	0.011	0.380	0.003	0.381	0.004	0.391	0.000
Model34	0.443	0.019	0.511	0.037	0.479	0.057	0.478	0.000
Model35	0.398	0.139	0.283	0.272	0.352	0.164	0.344	0.014
Model36	0.389	0.110	0.186	0.814	0.398	0.012	0.325	0.008
Model37	0.339	0.057	0.308	0.132	0.285	0.191	0.311	0.003
Model38	0.479	0.011	0.492	0.002	0.478	0.002	0.483	0.000
Model39	0.350	0.041	0.333	0.056	0.302	0.107	0.329	0.001
Model40	0.289	0.306	0.535	0.052	0.483	0.040	0.436	0.002
Model41	0.300	0.091	0.337	0.036	0.267	0.225	0.301	0.002
Model42	0.357	0.041	0.440	0.075	0.389	0.050	0.395	0.000
Model43	0.395	0.008	0.397	0.026	0.402	0.026	0.398	0.000
Model44	0.465	0.010	0.435	0.011	0.397	0.055	0.433	0.000
Model45	0.454	0.025	0.370	0.025	0.338	0.025	0.387	0.000
Model46	0.588	0.006	0.407	0.039	0.438	0.024	0.478	0.000
Model47	0.266	0.139	0.324	0.045	0.307	0.147	0.299	0.002
Model48	0.462	0.091	0.334	0.066	0.344	0.158	0.380	0.004
Model49	0.395	0.004	0.240	0.262	0.240	0.272	0.292	0.002
Model50	0.512	0.021	0.314	0.173	0.306	0.210	0.378	0.002
Model51	0.397	0.017	0.238	0.274	0.219	0.463	0.285	0.007
Model52	0.499	0.164	0.576	0.047	0.507	0.152	0.527	0.003
Model53	0.300	0.329	0.342	0.077	0.195	0.760	0.279	0.060
Model54	0.170	0.754	0.234	0.236	0.276	0.057	0.227	0.052
Model55	0.413	0.260	0.350	0.014	0.169	0.923	0.311	0.068
Model56	0.252	0.482	0.340	0.055	0.202	0.682	0.265	0.082
Model57	0.146	0.969	0.260	0.226	0.302	0.088	0.236	0.067
Model58	0.209	0.435	0.255	0.187	0.272	0.027	0.245	0.017

Table 27**MAE and DM p-value, France***Evaluation period: 2021Q4 - 2024Q3*

FR (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.179	0.265	0.219	0.176	0.188	0.491	0.195	0.053
Model2	0.157	0.404	0.164	0.377	0.136	0.827	0.153	0.272
Model3	0.171	0.489	0.203	0.230	0.187	0.325	0.187	0.081
Model4	0.191	0.369	0.181	0.320	0.179	0.385	0.184	0.095
Model5	0.193	0.342	0.184	0.308	0.186	0.315	0.188	0.071
Model6	0.193	0.342	0.184	0.308	0.186	0.315	0.188	0.071
Model8	0.245	0.080	0.234	0.046	0.218	0.054	0.232	0.001
Model9	0.157	0.404	0.164	0.377	0.136	0.827	0.153	0.272
Model10	0.179	0.422	0.172	0.502	0.190	0.521	0.180	0.187
Model11	0.116	0.903	0.167	0.465	0.146	0.881	0.143	0.663
Model12	0.208	0.420	0.187	0.306	0.177	0.383	0.191	0.128
Model13	0.116	0.901	0.168	0.459	0.148	0.839	0.144	0.640
Model14	0.160	0.580	0.179	0.359	0.177	0.224	0.172	0.144
Model15	0.198	0.457	0.151	0.829	0.100	0.528	0.150	0.708
Model16	0.261	0.148	0.123	0.869	0.100	0.528	0.161	0.473
Model17	0.356	0.035	0.213	0.086	0.241	0.087	0.270	0.001
Model18	0.356	0.035	0.213	0.086	0.241	0.087	0.270	0.001
Model19	0.337	0.050	0.198	0.215	0.156	0.830	0.230	0.029
Model20	0.337	0.050	0.210	0.171	0.223	0.228	0.257	0.005
Model23	0.232	0.091	0.162	0.384	0.126	0.751	0.173	0.148
Model25	0.188	0.300	0.129	0.973	0.125	0.778	0.148	0.629
Model26	0.282	0.090	0.177	0.407	0.186	0.412	0.215	0.031
Model27	0.185	0.365	0.137	0.915	0.132	0.800	0.152	0.509
Model28	0.250	0.185	0.184	0.282	0.197	0.299	0.210	0.036
Model29	0.236	0.217	0.139	0.900	0.120	0.584	0.165	0.378
Model30	0.270	0.124	0.250	0.269	0.176	0.555	0.232	0.039
Model31	0.182	0.010	0.160	0.583	0.148	0.874	0.163	0.160

FR (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model32	0.326	0.070	0.151	0.753	0.162	0.746	0.213	0.081
Model33	0.195	0.030	0.164	0.548	0.150	0.852	0.169	0.121
Model40	0.178	0.412	0.227	0.305	0.228	0.343	0.211	0.080
Model41	0.185	0.472	0.155	0.640	0.123	0.617	0.154	0.503
Model43	0.148	0.638	0.149	0.659	0.132	0.786	0.143	0.639
Model45	0.154	0.560	0.151	0.640	0.142	0.991	0.149	0.471
Model46	0.186	0.243	0.305	0.165	0.291	0.136	0.260	0.014
Model47	0.228	0.180	0.203	0.359	0.148	0.891	0.193	0.104
Model48	0.269	0.178	0.226	0.349	0.175	0.655	0.223	0.076
Model49	0.138	0.721	0.190	0.492	0.203	0.473	0.177	0.254
Model51	0.180	0.482	0.168	0.573	0.170	0.670	0.173	0.283
Model54	0.373	0.032	0.224	0.175	0.201	0.235	0.266	0.004
Model55	0.350	0.047	0.220	0.167	0.192	0.239	0.254	0.006
Model56	0.636	0.069	0.574	0.136	0.624	0.058	0.611	0.001
Model59	0.271	0.097	0.172	0.405	0.162	0.549	0.202	0.042
Model60	0.218	0.294	0.214	0.158	0.195	0.260	0.209	0.034
Model61	0.248	0.087	0.214	0.175	0.185	0.276	0.216	0.009
Model62	0.764	0.015	0.570	0.108	0.656	0.037	0.663	0.000
Model63	0.287	0.092	0.202	0.227	0.176	0.312	0.222	0.017
Model64	0.385	0.016	0.208	0.195	0.183	0.208	0.259	0.003
Model66	0.352	0.027	0.223	0.162	0.210	0.259	0.262	0.003
Model67	0.331	0.036	0.209	0.220	0.188	0.271	0.243	0.006
Model68	0.627	0.066	0.575	0.135	0.632	0.048	0.611	0.001
Model69	0.553	0.015	0.222	0.311	0.203	0.447	0.326	0.008
AR(1)	0.123		0.131		0.142		0.132	

Table 28**MAE and DM p-value, Italy***Evaluation period: 2021Q4 - 2024Q3*

IT (>70 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model3	0.146	0.233	0.097	0.082	0.107	0.084	0.117	0.004
Model5	0.183	0.332	0.124	0.134	0.139	0.171	0.149	0.017
Model6	0.137	0.134	0.155	0.109	0.131	0.138	0.141	0.005
Model7	0.183	0.332	0.124	0.134	0.139	0.171	0.149	0.017
Model8	0.137	0.134	0.155	0.109	0.131	0.138	0.141	0.005
Model43	0.196	0.412	0.183	0.106	0.183	0.078	0.187	0.025
Model45	0.197	0.362	0.191	0.131	0.193	0.093	0.194	0.023
Model46	0.350	0.559	0.106	0.191	0.229	0.616	0.228	0.429
Model49	0.182	0.216	0.237	0.542	0.211	0.110	0.210	0.046
Model51	0.176	0.191	0.228	0.430	0.211	0.107	0.205	0.030
AR(1)	0.283		0.273		0.277		0.278	

Appendix B2: model averages with outliers correction

Table 29

MAE and DM p-value, Netherlands
Evaluation period: 2024Q1 - 2024Q3

NL (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model1	0.747	0.103	0.734	0.160	0.783	0.171	0.755	0.007
Model2	0.747	0.103	0.734	0.160	0.783	0.171	0.755	0.007
Model3	0.610	0.579	0.601	0.574	0.609	0.462	0.607	0.544
Model4	0.572	0.975	0.615	0.681	0.623	0.563	0.603	0.483
Model5	0.614	0.595	0.587	0.517	0.603	0.469	0.601	0.514
Model6	0.576	0.970	0.590	0.523	0.603	0.453	0.590	0.351
Model7	0.592	0.857	0.642	0.935	0.636	0.775	0.623	0.875
Model8	0.591	0.866	0.566	0.480	0.557	0.346	0.571	0.318
Model9	0.747	0.103	0.734	0.160	0.783	0.171	0.755	0.007
Model10	0.750	0.113	0.760	0.040	0.818	0.126	0.776	0.003
Model11	0.588	0.812	0.605	0.505	0.604	0.329	0.599	0.341
Model12	0.571	0.961	0.596	0.469	0.593	0.306	0.587	0.233
Model13	0.587	0.819	0.604	0.505	0.604	0.329	0.598	0.338
Model14	0.574	0.999	0.594	0.464	0.595	0.321	0.588	0.248
Model15	0.893	0.086	1.006	0.029	1.045	0.032	0.981	0.000
Model16	0.780	0.183	0.815	0.083	0.845	0.096	0.813	0.005

NL (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model17	0.616	0.732	0.879	0.247	0.754	0.732	0.749	0.253
Model18	0.616	0.732	0.879	0.247	0.754	0.732	0.749	0.253
Model19	0.503	0.444	0.528	0.473	0.542	0.448	0.524	0.177
Model20	0.621	0.703	0.892	0.214	0.768	0.677	0.760	0.202
Model21	0.503	0.444	0.528	0.473	0.542	0.448	0.524	0.177
Model22	0.621	0.703	0.892	0.214	0.768	0.677	0.760	0.202
Model23	0.780	0.183	0.815	0.083	0.845	0.096	0.813	0.005
Model24	0.966	0.029	0.995	0.021	0.996	0.031	0.986	0.000
Model25	0.572	0.988	0.721	0.713	0.605	0.741	0.633	0.990
Model26	0.571	0.969	0.606	0.746	0.551	0.431	0.576	0.410
Model27	0.576	0.983	0.730	0.671	0.613	0.769	0.640	0.949
Model28	0.577	0.964	0.609	0.768	0.561	0.485	0.582	0.474
Model29	0.584	0.957	0.658	0.975	0.857	0.084	0.700	0.427
Model30	0.605	0.852	0.688	0.768	0.903	0.070	0.732	0.197
Model31	0.480	0.491	0.559	0.371	0.549	0.206	0.529	0.087
Model32	0.460	0.415	0.621	0.817	0.560	0.461	0.547	0.260
Model33	0.473	0.468	0.573	0.499	0.562	0.248	0.536	0.124
Model34	0.468	0.444	0.635	0.901	0.607	0.656	0.570	0.411
Model35	0.892	0.176	0.590	0.608	0.936	0.066	0.806	0.076
Model36	0.904	0.164	0.625	0.844	0.897	0.048	0.809	0.066
Model37	0.544	0.737	0.531	0.298	0.542	0.250	0.539	0.101
Model38	0.536	0.720	0.502	0.250	0.505	0.170	0.514	0.066
Model39	0.552	0.810	0.551	0.426	0.563	0.248	0.555	0.169
Model40	0.560	0.915	0.561	0.423	0.662	0.903	0.594	0.531
Model41	0.685	0.500	0.580	0.546	0.739	0.472	0.668	0.626
Model42	0.591	0.925	0.630	0.876	0.926	0.061	0.716	0.335
Model43	0.599	0.753	0.621	0.788	0.529	0.095	0.583	0.343
Model44	0.456	0.465	0.642	0.927	0.606	0.562	0.568	0.365
Model45	0.532	0.773	0.621	0.709	0.786	0.083	0.646	0.827
Model46	0.587	0.932	0.557	0.332	0.699	0.773	0.614	0.752
Model47	0.838	0.081	0.693	0.640	0.772	0.144	0.768	0.025

NL (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Model48	0.919	0.161	0.655	0.991	0.886	0.057	0.820	0.058
Model49	0.595	0.776	0.631	0.753	0.628	0.522	0.618	0.687
Model50	0.518	0.484	0.584	0.631	0.610	0.660	0.571	0.351
Model51	0.584	0.924	0.635	0.808	0.626	0.531	0.615	0.689
Model52	0.612	0.756	0.660	0.954	0.692	0.893	0.655	0.754
Model53	0.546	0.888	0.630	0.902	0.678	0.978	0.618	0.864
Model54	0.587	0.802	0.868	0.171	0.839	0.224	0.765	0.052
Model55	0.594	0.839	0.751	0.367	0.774	0.355	0.707	0.199
Model56	0.564	0.956	0.553	0.512	0.603	0.519	0.573	0.438
Model57	0.655	0.363	0.741	0.493	0.642	0.679	0.680	0.403
Model58	0.623	0.576	0.755	0.235	0.655	0.845	0.677	0.383

Table 30**MAE and DM p-value, euro area***Evaluation period: 2024Q1 - 2024Q3*

EA (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.095	0.395	0.122	0.862	0.057	0.474	0.091	0.234
Static (PCA)	0.050	0.076	0.082	0.225	0.079	0.547	0.070	0.017
Static (PLS)	0.050	0.076	0.082	0.225	0.079	0.547	0.070	0.017
Static (LASSO)	0.090	0.422	0.150	0.688	0.201	0.239	0.147	0.636
Static (RIDGE)	0.097	0.275	0.112	0.679	0.161	0.545	0.123	0.790
Static (EN)	0.053	0.247	0.088	0.235	0.099	0.851	0.080	0.115
Static (ALL)	0.044	0.262	0.060	0.025	0.067	0.400	0.057	0.016
Dynamic-EA, MAE-Top5	0.095	0.395	0.122	0.862	0.057	0.474	0.091	0.234
Dynamic-EA, MAE-Top10	0.200	0.655	0.158	0.883	0.216	0.386	0.191	0.323
Dynamic-EA, MAE-Top25	0.051	0.090	0.091	0.481	0.065	0.426	0.069	0.030
Dynamic-EA, MAE-Top50	0.099	0.420	0.127	0.863	0.100	0.774	0.108	0.345
Dynamic-EA, CONC-Top5	0.051	0.091	0.091	0.478	0.064	0.414	0.068	0.029
Dynamic-EA, CONC-Top10	0.100	0.434	0.132	0.938	0.099	0.756	0.110	0.378
Dynamic-EA, CONC-Top25	0.296	0.231	0.205	0.653	0.322	0.154	0.274	0.036
Dynamic-EA, CONC-Top50	0.296	0.231	0.205	0.653	0.259	0.245	0.253	0.055
Dynamic-Cou, MAE-Top5	0.149	0.967	0.133	0.958	0.114	0.996	0.132	0.994
Dynamic-Cou, MAE-Top10	0.047	0.051	0.048	0.184	0.044	0.363	0.046	0.006
Dynamic-Cou, MAE-Top25	0.146	0.994	0.128	0.868	0.125	0.829	0.133	0.964
Dynamic-Cou, MAE-Top50	0.146	0.994	0.128	0.868	0.125	0.829	0.133	0.964
Dynamic-Cou, CONC-Top5	0.064	0.323	0.119	0.807	0.107	0.922	0.097	0.310
Dynamic-Cou, CONC-Top10	0.064	0.323	0.119	0.807	0.109	0.941	0.097	0.315
Dynamic-Cou, CONC-Top25	0.296	0.231	0.205	0.653	0.259	0.245	0.253	0.055
AR(1)	0.146		0.136		0.113		0.132	

Table 31

MAE and DM p-value, Belgium

Evaluation period: 2024Q1 - 2024Q3

BE (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.169	0.816	0.159	0.560	0.164	0.058	0.164	0.131
Static (PCA)	0.365	0.124	0.211	0.343	0.129	0.464	0.235	0.027
Static (PLS)	0.297	0.051	0.258	0.123	0.227	0.055	0.261	0.000
Static (LASSO)	0.366	0.114	0.207	0.361	0.126	0.465	0.233	0.027
Static (RIDGE)	0.283	0.066	0.211	0.411	0.226	0.061	0.240	0.003
Static (EN)	0.366	0.114	0.207	0.361	0.126	0.465	0.233	0.027
Static (ALL)	0.283	0.066	0.211	0.411	0.226	0.061	0.240	0.003
Dynamic-EA, MAE-Top5	0.169	0.816	0.159	0.560	0.164	0.058	0.164	0.131
Dynamic-EA, MAE-Top10	0.237	0.252	0.242	0.028	0.194	0.225	0.224	0.004
Dynamic-EA, MAE-Top25	0.282	0.282	0.212	0.182	0.188	0.006	0.227	0.006
Dynamic-EA, MAE-Top50	0.320	0.254	0.206	0.187	0.182	0.036	0.236	0.011
Dynamic-EA, CONC-Top5	0.281	0.281	0.212	0.180	0.188	0.005	0.227	0.006
Dynamic-EA, CONC-Top10	0.320	0.253	0.207	0.172	0.181	0.037	0.236	0.011
Dynamic-EA, CONC-Top25	0.292	0.199	0.274	0.115	0.286	0.002	0.284	0.000
Dynamic-EA, CONC-Top50	0.292	0.199	0.274	0.115	0.286	0.002	0.284	0.000
Dynamic-Cou, MAE-Top5	0.568	0.027	0.466	0.003	0.455	0.032	0.496	0.000
Dynamic-Cou, MAE-Top10	0.456	0.023	0.370	0.007	0.363	0.020	0.396	0.000
Dynamic-Cou, MAE-Top25	0.458	0.050	0.407	0.000	0.397	0.031	0.420	0.000
Dynamic-Cou, MAE-Top50	0.402	0.043	0.352	0.003	0.344	0.031	0.366	0.000
Dynamic-Cou, CONC-Top5	0.458	0.050	0.407	0.000	0.397	0.031	0.420	0.000
Dynamic-Cou, CONC-Top10	0.402	0.043	0.352	0.003	0.344	0.031	0.366	0.000
Dynamic-Cou, CONC-Top25	0.292	0.199	0.274	0.115	0.286	0.002	0.284	0.000
Dynamic-Cou, CONC-Top50	0.059	0.052	0.088	0.625	0.077	0.848	0.075	0.198
AR(1)	0.149		0.132		0.068		0.116	

Table 32**MAE and DM p-value, Germany***Evaluation period: 2024Q1 - 2024Q3*

DE (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.202	0.542	0.208	0.182	0.204	0.261	0.205	0.029
Static (PCA)	0.298	0.820	0.244	0.039	0.259	0.065	0.267	0.050
Static (PLS)	0.298	0.820	0.244	0.039	0.259	0.065	0.267	0.050
Static (LASSO)	0.281	0.921	0.242	0.034	0.243	0.040	0.255	0.026
Static (RIDGE)	0.281	0.921	0.242	0.034	0.243	0.040	0.255	0.026
Static (EN)	0.201	0.642	0.107	0.140	0.223	0.386	0.177	0.046
Static (ALL)	0.260	0.960	0.150	0.095	0.211	0.182	0.207	0.052
Dynamic-EA, MAE-Top5	0.202	0.542	0.208	0.182	0.204	0.261	0.205	0.029
Dynamic-EA, MAE-Top10	0.225	0.501	0.225	0.128	0.155	0.141	0.202	0.013
Dynamic-EA, MAE-Top25	0.257	0.926	0.264	0.320	0.226	0.257	0.249	0.096
Dynamic-EA, MAE-Top50	0.220	0.795	0.223	0.232	0.209	0.237	0.217	0.065
Dynamic-EA, CONC-Top5	0.258	0.928	0.264	0.320	0.226	0.257	0.249	0.097
Dynamic-EA, CONC-Top10	0.201	0.727	0.215	0.202	0.205	0.213	0.207	0.048
Dynamic-EA, CONC-Top25	0.363	0.315	0.297	0.412	0.418	0.901	0.359	0.709
Dynamic-EA, CONC-Top50	0.363	0.315	0.297	0.412	0.298	0.281	0.319	0.347
Dynamic-Cou, MAE-Top5	0.233	0.856	0.185	0.145	0.308	0.463	0.242	0.112
Dynamic-Cou, MAE-Top10	0.261	0.966	0.204	0.126	0.327	0.526	0.264	0.164
Dynamic-Cou, MAE-Top25	0.246	0.907	0.206	0.135	0.315	0.477	0.256	0.133
Dynamic-Cou, MAE-Top50	0.252	0.931	0.202	0.124	0.309	0.457	0.255	0.130
Dynamic-Cou, CONC-Top5	0.246	0.907	0.206	0.135	0.315	0.477	0.256	0.133
Dynamic-Cou, CONC-Top10	0.252	0.931	0.202	0.124	0.309	0.457	0.255	0.130
Dynamic-Cou, CONC-Top25	0.363	0.315	0.297	0.412	0.298	0.281	0.319	0.347
AR(1)	0.270		0.456		0.441		0.389	

Table 33

MAE and DM p-value, Spain

Evaluation period: 2024Q1 - 2024Q3

ES (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.285	0.077	0.561	0.776	0.276	0.309	0.374	0.051
Dynamic-EA, MAE-Top5	0.285	0.077	0.561	0.776	0.276	0.309	0.374	0.051
Dynamic-EA, MAE-Top10	0.204	0.096	0.502	0.527	0.288	0.122	0.331	0.011
Dynamic-EA, CONC-Top25	0.852	0.873	0.742	0.852	0.806	0.757	0.800	0.917
Dynamic-EA, CONC-Top50	0.852	0.873	0.742	0.852	0.806	0.757	0.800	0.917
Dynamic-Cou, CONC-Top25	0.852	0.873	0.742	0.852	0.806	0.757	0.800	0.917
Dynamic-Cou, CONC-Top50	0.696	0.650	0.564	0.712	0.546	0.609	0.602	0.342
AR(1)	0.933		0.695		0.719		0.782	

Table 34**MAE and DM p-value, France***Evaluation period: 2024Q1 - 2024Q3*

FR (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.096	0.906	0.093	0.599	0.106	0.568	0.098	0.345
Static (PCA)	0.084	0.825	0.105	0.410	0.098	0.400	0.096	0.239
Static (PLS)	0.084	0.825	0.105	0.410	0.098	0.400	0.096	0.239
Static (LASSO)	0.090	0.948	0.104	0.463	0.100	0.428	0.098	0.241
Static (RIDGE)	0.090	0.948	0.104	0.463	0.100	0.428	0.098	0.241
Static (EN)	0.090	0.948	0.104	0.463	0.100	0.428	0.098	0.241
Static (ALL)	0.090	0.948	0.104	0.463	0.100	0.428	0.098	0.241
Dynamic-EA, MAE-Top5	0.096	0.906	0.093	0.599	0.106	0.568	0.098	0.345
Dynamic-EA, MAE-Top10	0.195	0.472	0.272	0.250	0.244	0.320	0.237	0.039
Dynamic-EA, MAE-Top25	0.111	0.695	0.083	0.165	0.068	0.199	0.087	0.177
Dynamic-EA, MAE-Top50	0.193	0.288	0.030	0.450	0.048	0.971	0.090	0.537
Dynamic-EA, CONC-Top5	0.112	0.690	0.083	0.181	0.067	0.248	0.087	0.189
Dynamic-EA, CONC-Top10	0.187	0.308	0.027	0.457	0.061	0.814	0.092	0.488
Dynamic-EA, CONC-Top25	0.132	0.750	0.309	0.125	0.214	0.069	0.218	0.023
Dynamic-EA, CONC-Top50	0.132	0.750	0.309	0.125	0.214	0.069	0.218	0.023
Dynamic-Cou, MAE-Top5	0.115	0.270	0.101	0.083	0.083	0.172	0.099	0.003
Dynamic-Cou, MAE-Top10	0.102	0.808	0.083	0.491	0.066	0.528	0.083	0.302
Dynamic-Cou, MAE-Top25	0.106	0.689	0.074	0.717	0.040	0.786	0.073	0.753
Dynamic-Cou, MAE-Top50	0.106	0.689	0.074	0.717	0.040	0.786	0.073	0.753
Dynamic-Cou, CONC-Top5	0.106	0.689	0.074	0.717	0.040	0.786	0.073	0.753
Dynamic-Cou, CONC-Top10	0.106	0.689	0.074	0.717	0.040	0.786	0.073	0.753
Dynamic-Cou, CONC-Top25	0.132	0.750	0.309	0.125	0.211	0.074	0.217	0.023
Dynamic-Cou, CONC-Top50	0.159	0.559	0.202	0.258	0.232	0.209	0.198	0.033
AR(1)	0.092		0.063		0.050		0.068	

Table 35**MAE and DM p-value, Italy***Evaluation period: 2024Q1 - 2024Q3*

IT (>60 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (DFA)	0.125	0.327	0.090	0.177	0.119	0.767	0.111	0.694
Static (PCA)	0.243	0.384	0.101	0.913	0.063	0.077	0.136	0.615
Static (PLS)	0.297	0.337	0.092	0.736	0.087	0.077	0.159	0.457
Static (LASSO)	0.292	0.344	0.089	0.724	0.076	0.078	0.152	0.509
Static (RIDGE)	0.292	0.344	0.089	0.724	0.076	0.078	0.152	0.509
Static (EN)	0.321	0.233	0.356	0.426	0.159	0.870	0.279	0.108
Static (ALL)	0.288	0.214	0.131	0.671	0.105	0.305	0.175	0.234
Dynamic-EA, MAE-Top5	0.125	0.327	0.090	0.177	0.119	0.767	0.111	0.694
Dynamic-EA, MAE-Top10	0.141	0.343	0.118	0.801	0.126	0.677	0.128	0.348
Dynamic-EA, MAE-Top25	0.215	0.275	0.149	0.472	0.099	0.414	0.154	0.278
Dynamic-EA, MAE-Top50	0.250	0.345	0.116	0.942	0.092	0.109	0.153	0.428
Dynamic-EA, CONC-Top5	0.216	0.276	0.150	0.462	0.100	0.438	0.156	0.273
Dynamic-EA, CONC-Top10	0.241	0.360	0.126	0.829	0.112	0.431	0.160	0.354
Dynamic-EA, CONC-Top25	0.199	0.240	0.071	0.612	0.164	0.587	0.145	0.337
Dynamic-EA, CONC-Top50	0.199	0.240	0.165	0.190	0.164	0.587	0.176	0.061
Dynamic-Cou, MAE-Top5	0.538	0.240	0.264	0.396	0.330	0.279	0.377	0.042
Dynamic-Cou, MAE-Top10	0.538	0.240	0.264	0.396	0.330	0.279	0.377	0.042
Dynamic-Cou, MAE-Top25	0.510	0.280	0.292	0.326	0.301	0.143	0.368	0.044
Dynamic-Cou, MAE-Top50	0.510	0.280	0.292	0.326	0.365	0.223	0.389	0.035
Dynamic-Cou, CONC-Top5	0.189	0.282	0.131	0.708	0.056	0.035	0.125	0.585
Dynamic-Cou, CONC-Top10	0.162	0.313	0.148	0.482	0.125	0.718	0.145	0.223
Dynamic-Cou, CONC-Top25	0.199	0.240	0.165	0.190	0.202	0.418	0.189	0.039
AR(1)	0.050		0.111		0.139		0.100	

Table 36**MAE and DM p-value, Netherlands***Evaluation period: 2024Q1 - 2024Q3*

NL (>80 %)								
	T-30		T		T+15		ALL	
	MAE	DM	MAE	DM	MAE	DM	MAE	DM
Static (PLS)	0.632	0.647	0.774	0.905	0.703	0.608	0.703	0.456
Static (RIDGE)	0.631	0.643	0.773	0.901	0.704	0.613	0.703	0.453
Static (ALL)	0.631	0.643	0.773	0.901	0.704	0.613	0.703	0.453
Dynamic-EA, MAE-Top25	0.632	0.647	0.774	0.905	0.703	0.608	0.703	0.456
Dynamic-EA, MAE-Top50	0.618	0.530	0.845	0.778	0.767	0.968	0.743	0.905
Dynamic-EA, CONC-Top5	0.631	0.643	0.773	0.901	0.700	0.596	0.702	0.443
Dynamic-EA, CONC-Top10	0.618	0.522	0.845	0.768	0.767	0.966	0.743	0.906
Dynamic-Cou, MAE-Top25	0.670	0.808	0.788	0.941	0.797	0.654	0.752	0.991
Dynamic-Cou, CONC-Top5	0.822	0.490	0.735	0.498	0.609	0.078	0.722	0.652
Dynamic-Cou, CONC-Top10	0.822	0.490	0.735	0.498	0.573	0.005	0.710	0.542
AR(1)	0.699		0.793		0.762		0.751	

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of the European Union

ISBN 978-92-68-31070-0